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CANADIAN MACHINERY AND MANUFACTURING NEWS

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SKF

How to save power by reducing friction
—in transmission
—in machines.

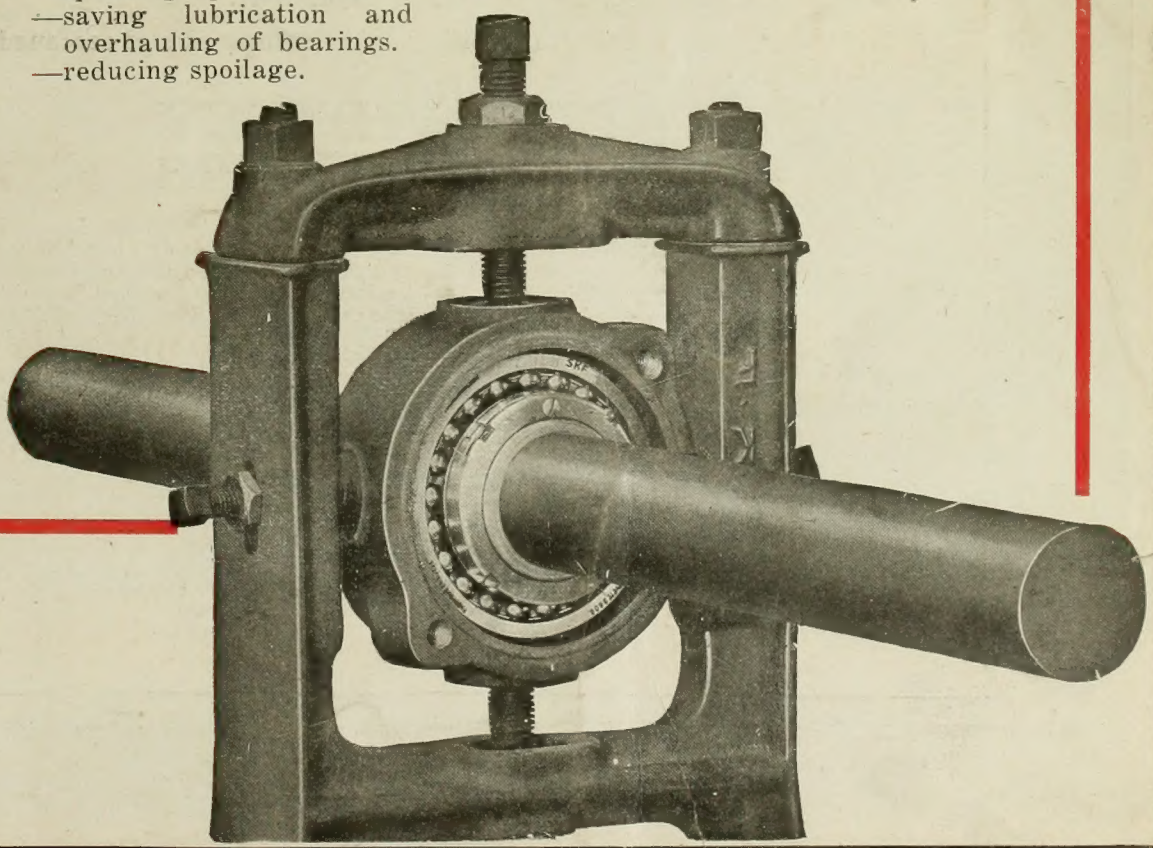
How to improve product by
—insuring accuracy and precision of machines.
—increasing speed.

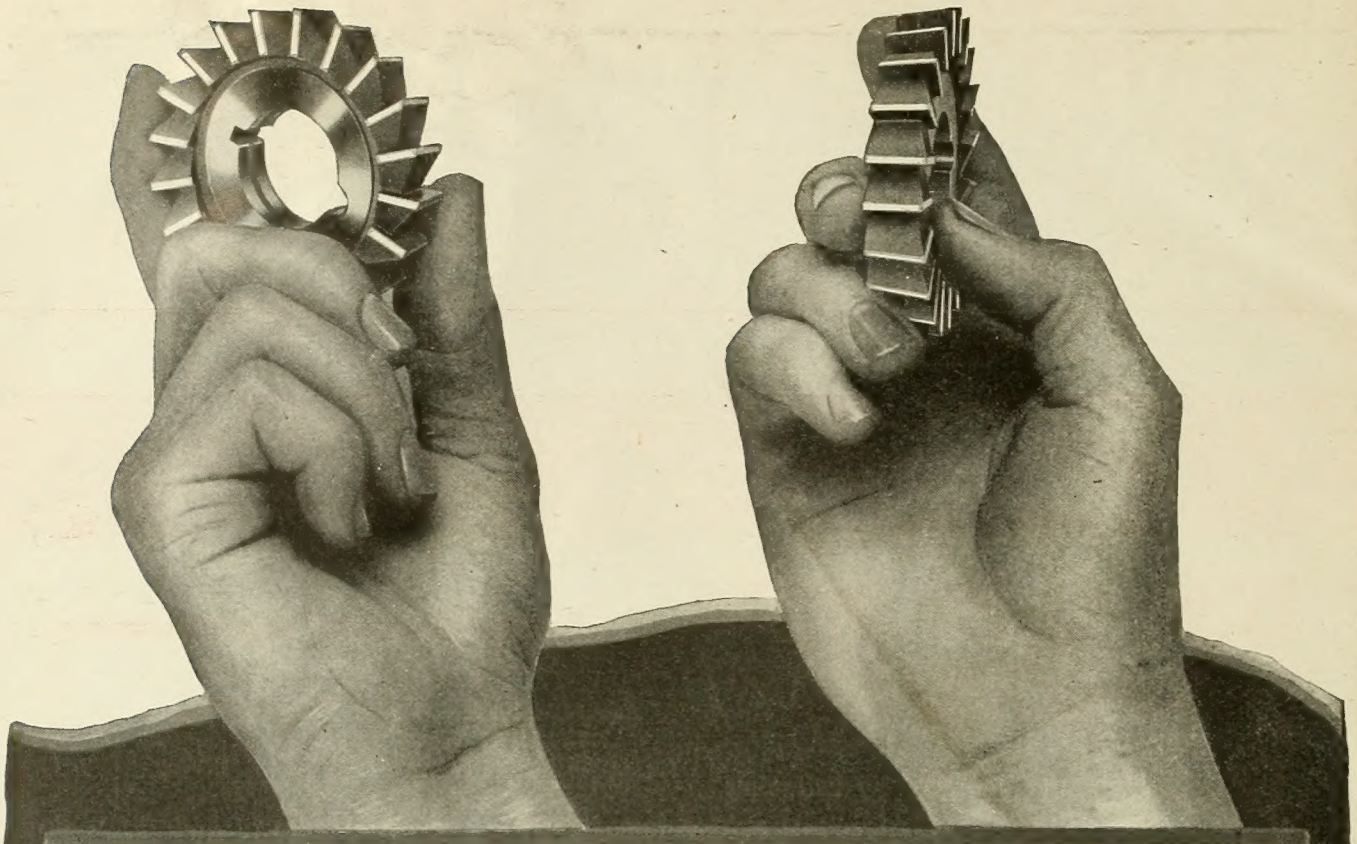
How to reduce production costs by
—speeding up machines.
—saving lubrication and overhauling of bearings.
—reducing spoilage.

Our Engineers gather experience in these important questions from every civilized country of the world and place it at your disposal.

No charge, nor obligation, in consulting our engineers.

CANADIAN SKF COMPANY
LIMITED
Toronto and Montreal





If it's speed you need—

One trial will prove the advantage of Pratt & Whitney Milling Cutters. No matter what the nature of the work they will give you the highest production the machine is capable of.

They're designed for free, fast cutting. And tempered and seasoned to last longer.

PRATT & WHITNEY MILLING CUTTERS

Ask us for prices and details on Plain Milling Cutters, Side Milling Cutters, Inserted Blade End and Side Cutters, Screw Slot Cutters, Coarse Tooth Side or Plain Milling Cutters, Involute Gear Cutters, Concave, Convex and Double Angle Cutters, Cutters for Spiral Mills, Roll Thread Die Hobs, Key-Seating and Slotting Cutters, Straight and Spiral Cut End Mills (B. & S. and M. T. Shank), Spiral and Straight Shell End Mills, etc.

And we make formed cutters for special work also. All are backed by the guarantee for goodness that the P. & W. trademark indicates.

PRATT & WHITNEY COMPANY OF CANADA, LIMITED

Works: DUNDAS, Ontario

MONTREAL
723 Drummond Bldg.

TORONTO
1002 C.P.R. Bldg.

WINDSOR
Davis Bldg.

WINNIPEG
1205 McArthur Bldg.

HALIFAX
Roy Building

VANCOUVER
B.C. Equipment Co.

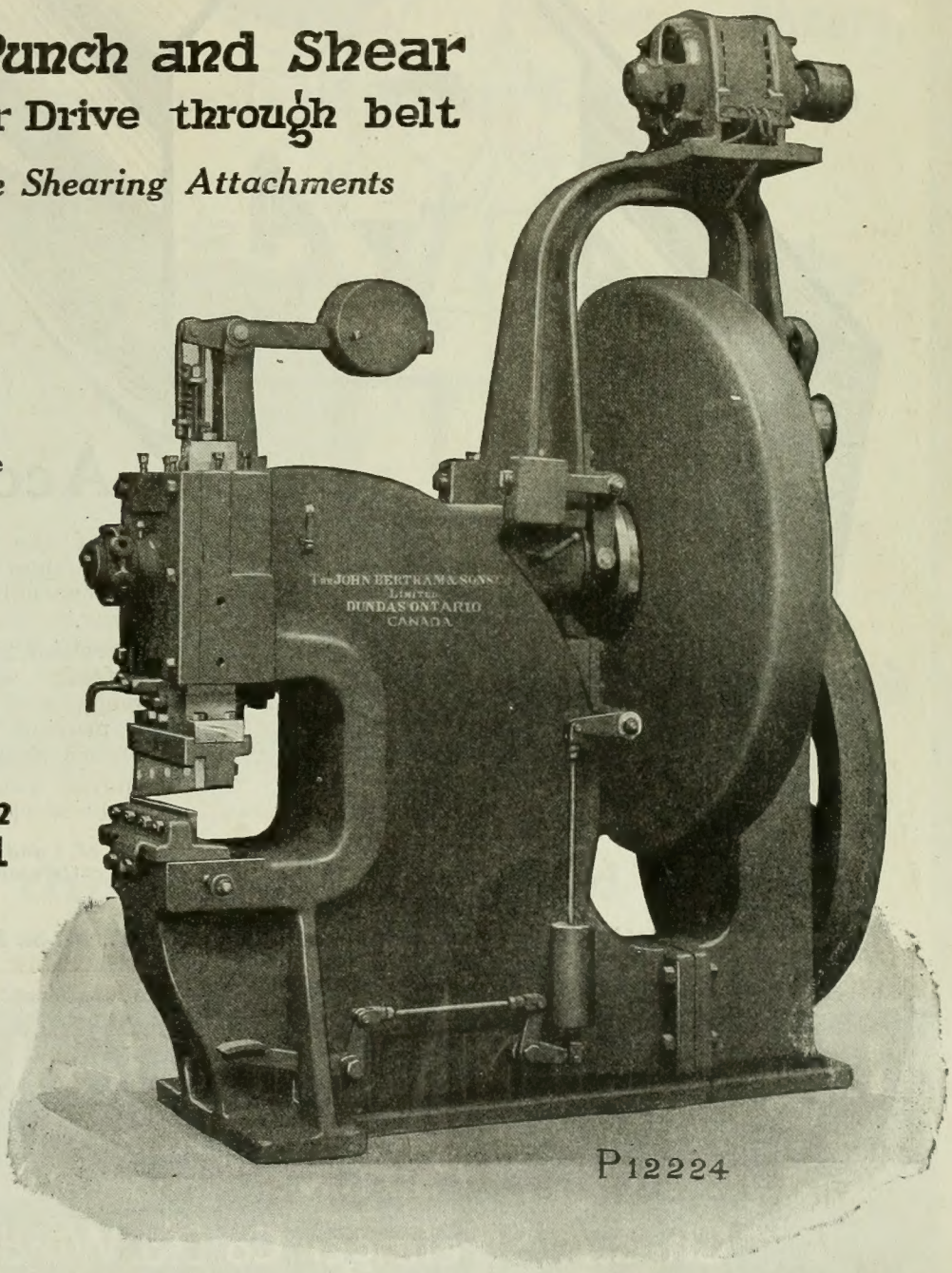
The BERTRAM Page

MACHINE TOOLS

No.4 Single Punch and Shear

12"Throat Motor Drive through belt

Fitted with Plate Shearing Attachments



Capacity

To punch 1" hole through 1" Plate
To shear 1" Plates
To " 6"x1" Flat Bars
To " 1¾" Round Bars
To " 4x4x⅜" Angles

The John Bertram & Sons Co., Limited
DUNDAS. ONTARIO.

MONTREAL
723 Drummond Building

TORONTO
1002 C.P.R. Building

VANCOUVER
609 Bank of Ottawa Building

WINDSOR
Davis Building

WINNIPEG
1205 McArthur Building

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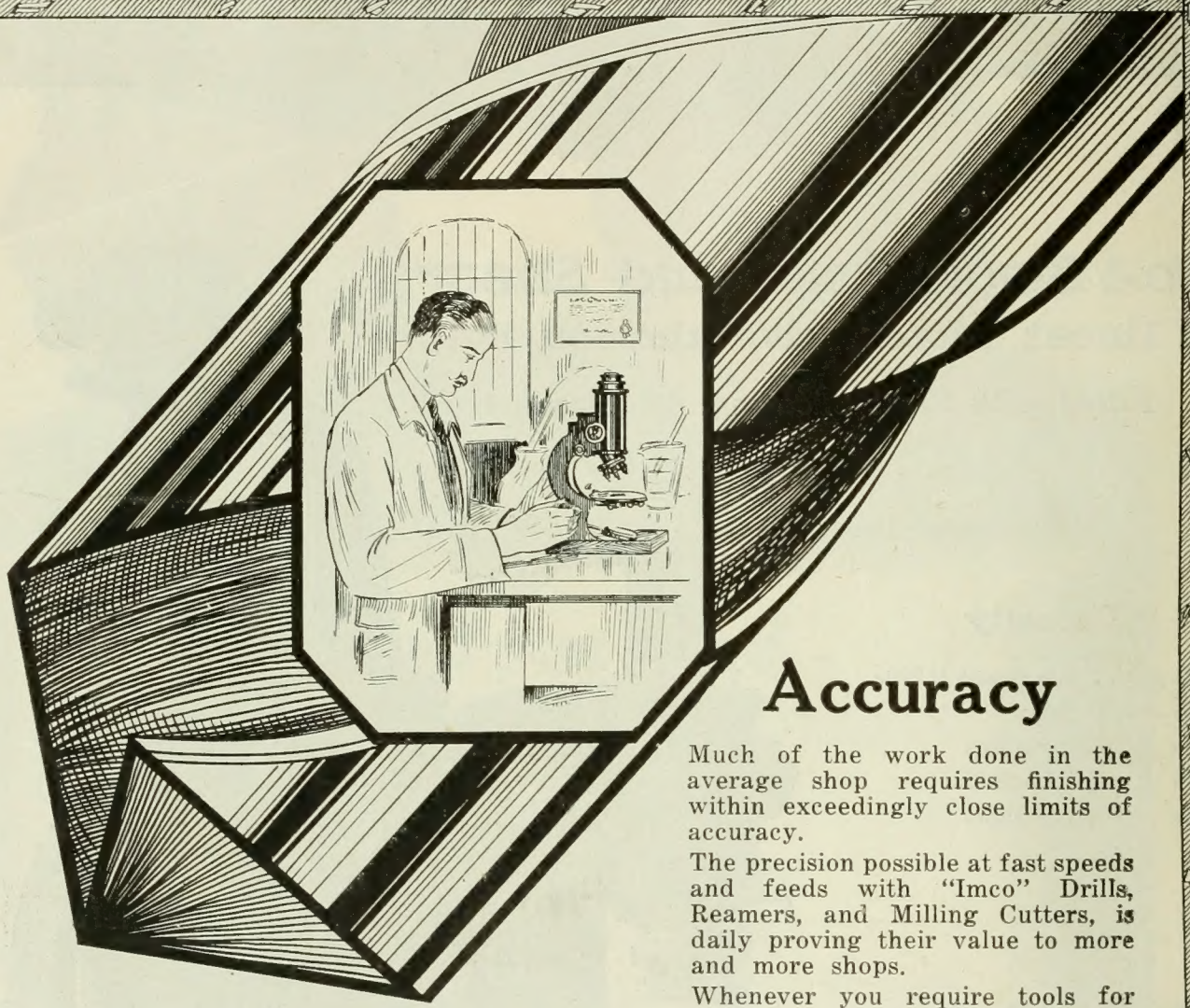
Roy Building

IMCO TOOLS



Accuracy

Much of the work done in the average shop requires finishing within exceedingly close limits of accuracy.

The precision possible at fast speeds and feeds with "Imco" Drills, Reamers, and Milling Cutters, is daily proving their value to more and more shops.

Whenever you require tools for accurate work—think of "Imco."

Catalog of 3 and 4 lip drills, reamers and milling cutters upon request.

Eastern Representatives: WATT MACHINERY & EQUIPMENT CO., 344 St. James St., Montreal, Que.

Ingersoll Machine & Tool Co., Ltd.

Ingersoll, Ontario.

Toronto Office — 80 Bay St. Phone Adelaide 7227.

Chas. A. Strelinger Co. Ltd. Windsor, Ont.

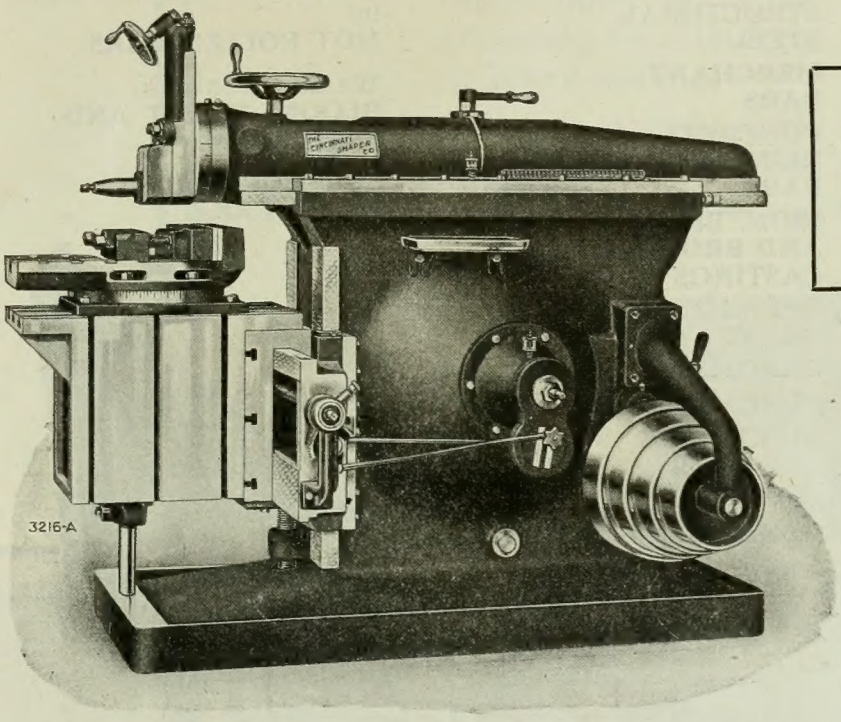
H.W. PETRIE LIMITED

Canada's Dependable Machinery and Supply House

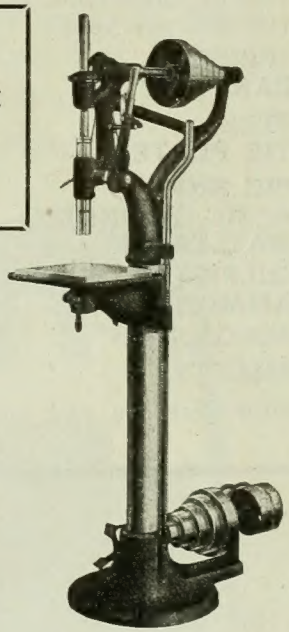
H.W. PETRIE LIMITED TORONTO

Shapers, Planers, Drills, Presses,
Millers, Grinders, Punches, Shears,

And Machine Tools of Every Description



Prompt Shipment from Stock



What is the Tool You Need To-day?

W. H. Petrie, Limited, has gained a national reputation for furnishing the requirements of the machine and woodworking shops to the letter and with exceptional promptness. Petrie always has an immense variety of machine tools on their warehouse floors. This advantage, coupled with the best of shipping facilities, assures unequalled service. When you need Machine Tools or Supplies of any kind, think of Canada's Dependable Machinery and Supply House.

What Are Your Requirements? We Can Fill Them!

H. W. PETRIE LIMITED

TORONTO -- HAMILTON

If interested tear out this page and place with letters to be answered.

ALGOMA

STEEL CORPORATION Limited

SAULT STE. MARIE, ONTARIO

Sales Offices:
Montreal, 606 McGill Building
Toronto:
Bank of Hamilton Building

STEEL RAILS
Open Hearth Quality
(All Sections from 12 lbs. to 100 lbs. per yard)

SPLICE BARS

STEEL TIE PLATES

PIG IRON
BASIC, FOUNDRY—MALLEABLE

SULPHATE OF AMMONIA

BLOOMS

BILLETS

SLABS

STRUCTURAL STEEL

MERCHANT BARS

CONCRETE REINFORCING BARS

IRON, BRASS AND BRONZE CASTINGS

OPEN HEARTH ALLOY STEELS

CHROME-VANADIUM

CHROME-NICKEL

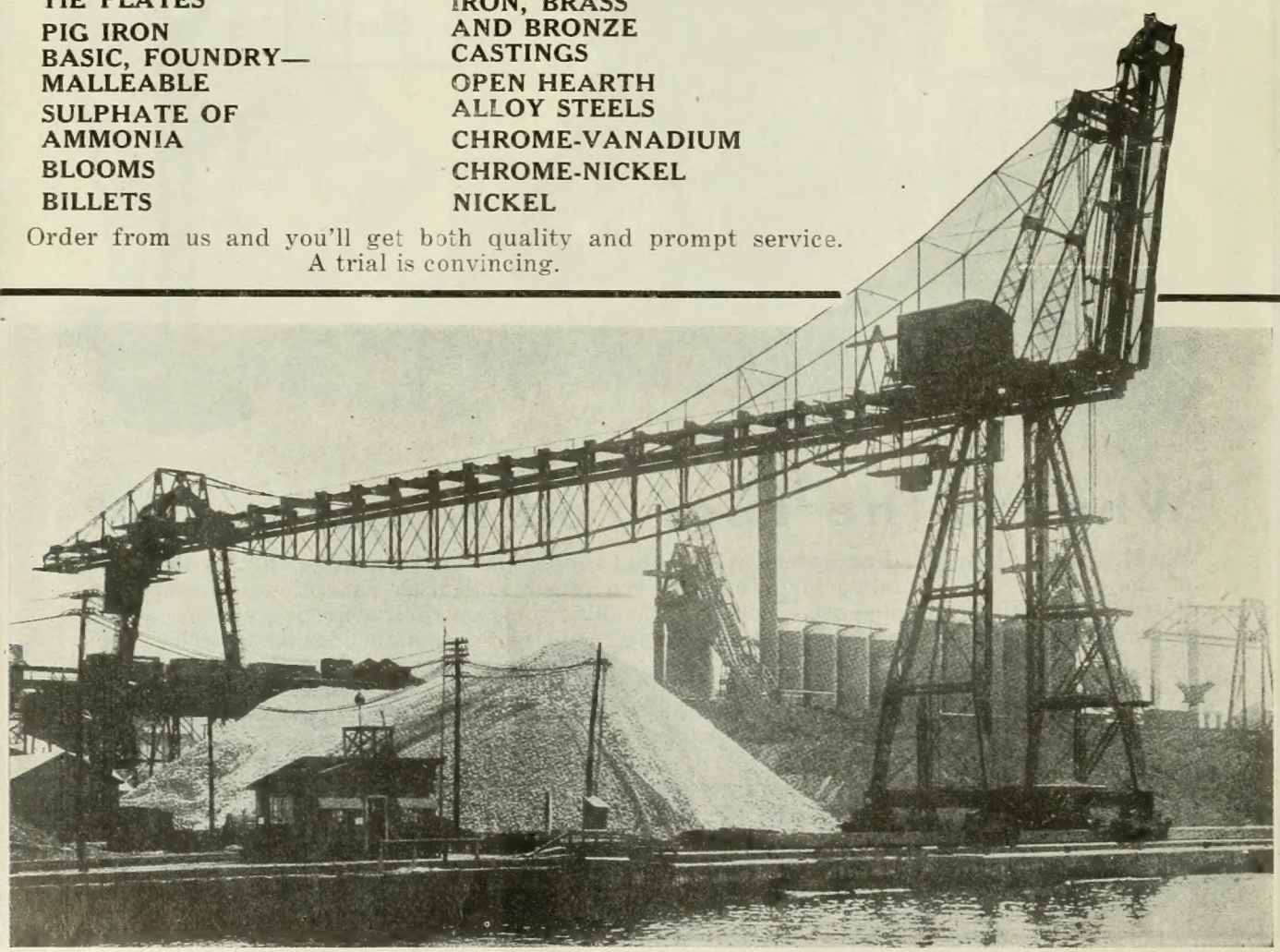
NICKEL

All of these steels we supply in
HOT ROLLED BARS

We also furnish in
BLOOM, BILLET AND SLAB FORM.

SULPHURIC ACID
NITRE CAKE

Order from us and you'll get both quality and prompt service.
A trial is convincing.



MILWAUKEE MILLING MACHINES

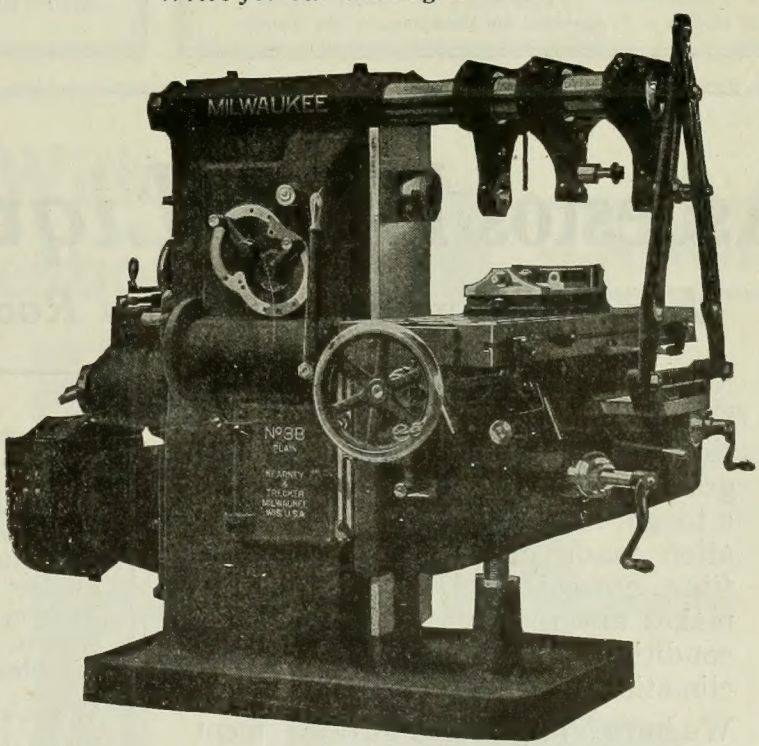
EFFICIENT MILLING

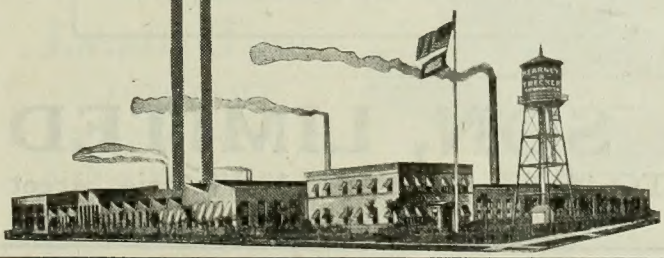
The rigidity and reserve power of Milwaukee Milling Machines permit high speeds and deep cuts without impairing the accuracy of the work.

These sturdy machines are quickly set up and easily operated. They are economical on light or heavy milling.

Constant speed drive, hardened steel gears and shafts, automatic flooded lubrication, double overarm, solid top, box-section knee with extended slide, flanged spindle, reverse self-contained, cutter lubricating pump that operates only when spindle revolves—these are the features that make Milwaukee Milling Machines profitable producers.

Write for our catalogue—NOW



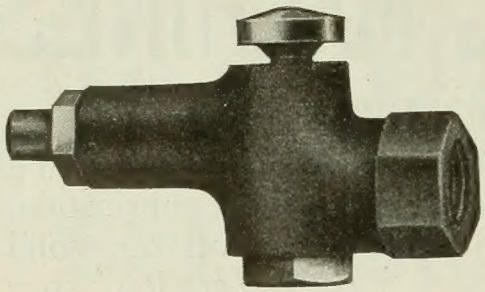


KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

Canadian Representatives:

Williams & Wilson, Ltd., Montreal; F. F. Barber Machy. Co., Toronto. A. R. Williams Machy. Co., Vancouver and Winnipeg.

CLEAN WITH AIR



By simply pressing the button the CIRCO BLOW GUN will give you a powerful cleaning jet whenever and wherever you want it, and the flow of air stops the instant the operator's thumb is removed from the button, thus eliminating the time wasted in opening and closing a globe valve or kinking the air hose while the valve is being opened or closed.

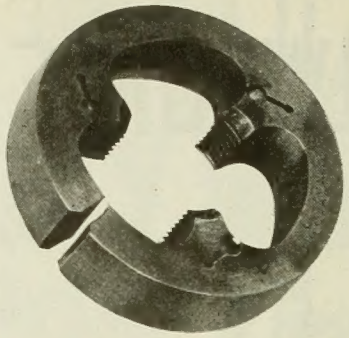
The CIRCO BLOW GUN is a sturdy little tool made from a bronze casting and has a metal to metal seat for the valve. It contains no gaskets or delicate parts to get out of order so that it will last a long time and will not leak.

Write for Prices.

Canadian Ingersoll-Rand Company, Limited.

Sydney Sherbrooke Montreal Toronto Cobalt
Winnipeg Nelson Vancouver

Largest Makers of Compressed Air Machinery in the Empire



NAMCO

PATENTED ADJUSTABLE SCREW-CUTTING DIE

A button type of die with adjustable features made possible by split ring and taper pins. Adaptable to all classes of threading, including pitches and materials varying from the accepted standards.

Made up special to order only.

THE NATIONAL ACME CO.

MONTREAL, P. Q. CLEVELAND, O.

Asbestos Fibre (*Liquid*) Cement

For Making Old and New Roofs Weatherproof

No expert is needed to put Asbestos Fibre Cement on. Simply apply it right on any kind of roof—metal, gravel, paper, or composition. It is a tough, rubberlike, adhesive preparation made of the finest asbestos fibre, creosote and durable oils. It makes any roof, no matter what its condition, absolutely proof against climatic conditions.

We have a large stock of this cement in barrel lots. Let us quote you prices.

English Millboard

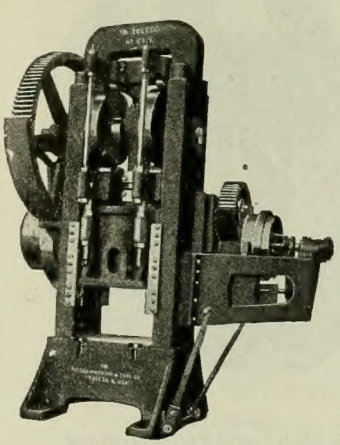
We have a large stock of the finest Grey English Millboard ready for immediate shipment. The high quality of this board is very well known. If you have not already seen it, we shall be glad to send you samples.

We can supply the millboard in three thicknesses—3/16″, 1/4″ and 5/16″. Shall we quote you prices?

RICE LEWIS & SON, LIMITED

Established 1847 TORONTO, ONT. 19 Victoria Street

THE "TOLEDO" PRESSES



Carry with them assurance of the most exceptional performance—due to the excellence of design—the care and skill in construction and the high-grade of materials used. The "Toledo" Double Action Cam Drawing Presses are particularly adapted for cutting and drawing, in one operation, cups and shells made from comparatively heavy metal.

PRESSES FOR EVERY NEED

THE TOLEDO MACHINE & TOOL CO.

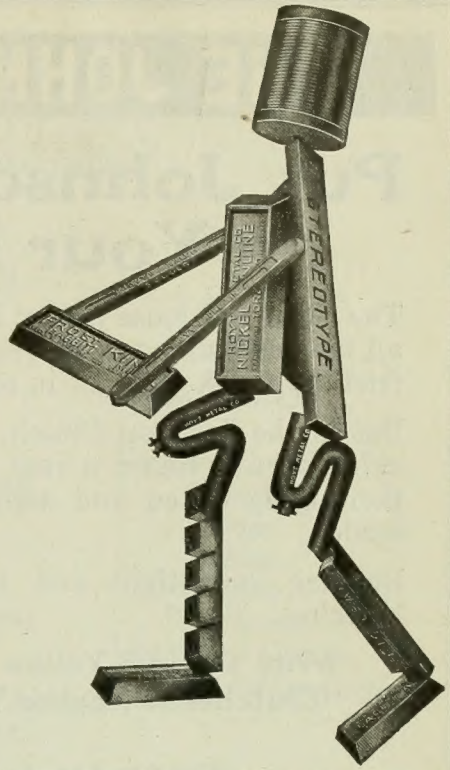
TOLEDO, OHIO

FROST KING BABBITT.

will withstand heavy pressure without increasing its temperature.

For general machinery bearings it is without a peer.

If you are from Missouri try a sample lot and be convinced.



HOYT METAL COMPANY

MONTREAL TORONTO WINNIPEG

One Machine With a Score of Applications

The LANDIS is not only a powerful Boring, Drilling and Milling Machine, but it is versatile because of its ability to perfectly perform scores of machining operations.

A single set-up of the work on the LANDIS permits of a number of machinings and the minutes usually occupied by shifting are turned to producing.

Low-cost production is imperative. The LANDIS gives it.

All the details are in the Catalog. Send in your name for our mailing list.

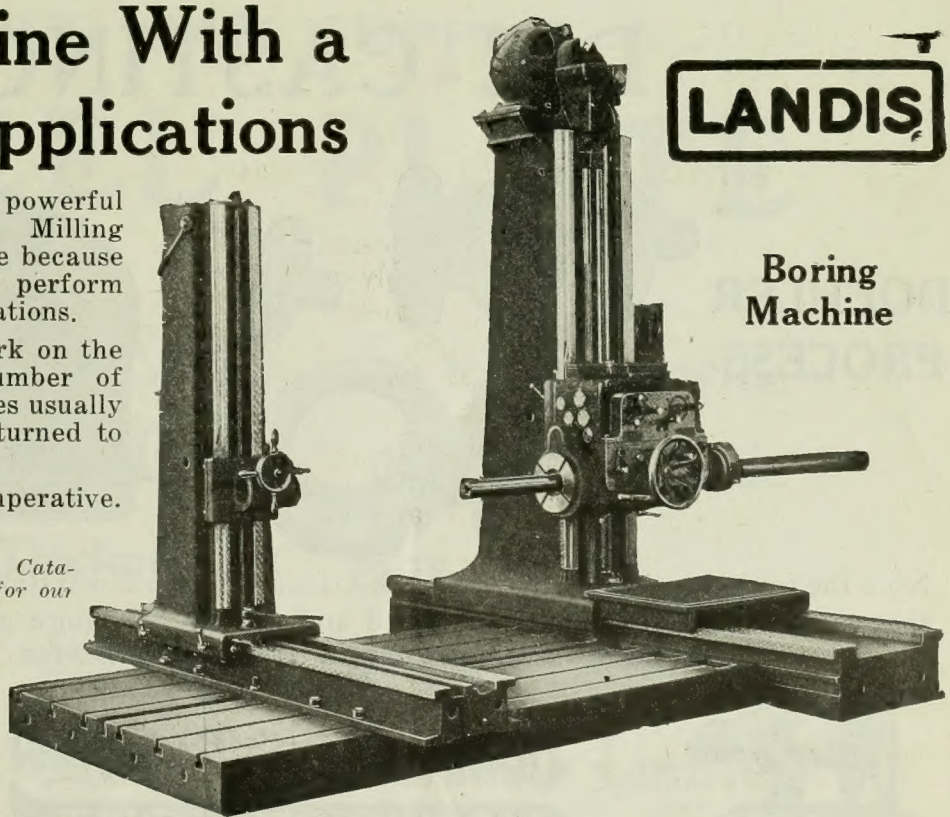
Landis Tool Company

Waynesboro, Pa.

New York Office: 50 Church St.

LANDIS

Boring Machine



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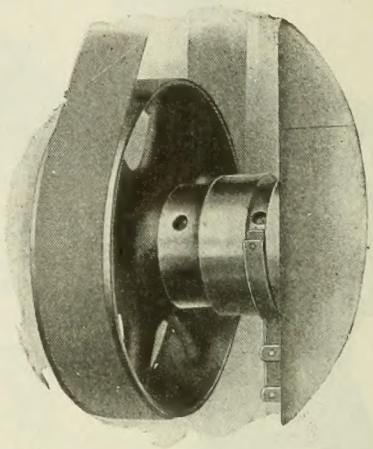
THE JOHNSON FRICTION CLUTCH

Put Johnson Clutches on Your Machines

The tight and loose pulley is passing from favor. With all its disadvantages, it long survived because a reliable friction clutch was not in evidence.

But in the Johnson Clutch, builders of high grade machinery have found a real clutch service. It has been thoroughly tested and adopted on the finest machines made.

Replace your tight and loose pulleys with Johnson Clutches.



Single Clutch with Pulley Mounted

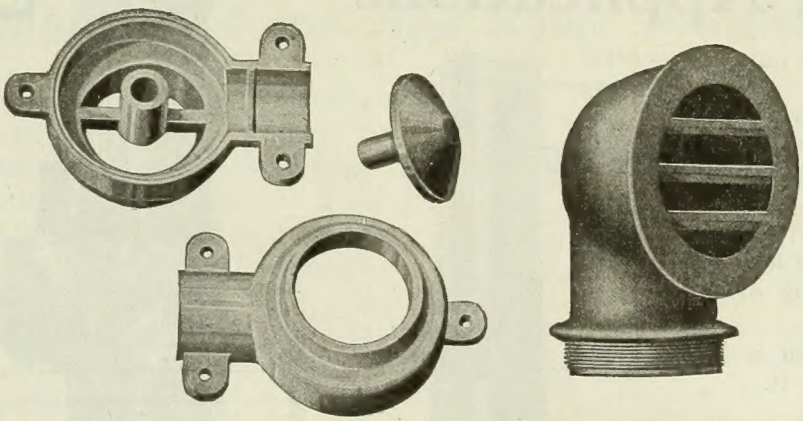
Write for our Yellow Catalog and Booklet, "Clutches As Applied To Machine Building."

CANADIAN AGENTS:
WILLIAMS & WILSON, LTD., 84 Inspector St., Montreal
CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

DIE-CASTINGS

DOEHLER PROCESS



MADE IN CANADA

Note the smooth appearance of the Die-Castings in the illustration. No burrs—no rough spots. Cored holes are perfectly round and centred. Require practically no machining

SEND BLUE PRINTS TO US FOR ESTIMATES

Manufactured by

Tallman Brass & Metal Limited
HAMILTON, ONT.

CANADIAN STEEL FOUNDRIES LIMITED

AMONG OUR PRODUCTS

O. H. STEEL
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
- Wheel Centres

FERRO-ALLOYS

MANGANESE-STEEL
- Bucket Lips
- Crusher Jaws
- Dipper Teeth
- Mixer Teeth
- Special Trackwork

OTHER ALLOYS
- Crank Pins
- Crank Shafts
- Locomotive Frames
- Rolls
- Roll Shells

TRACKWORK
- Diamond Crossings
- Crosses
- Frogs
- Mates
- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersection

This list is merely an indication

General Offices:
Transportation Building, Montreal

WE CAN SUPPLY

STEEL PLATE

—IN—

Universal Edge - up to 40 in. wide

Sheared Edge - up to 60 in. wide

Any Thickness **Any Lengths**

Send Us Your Enquiries.

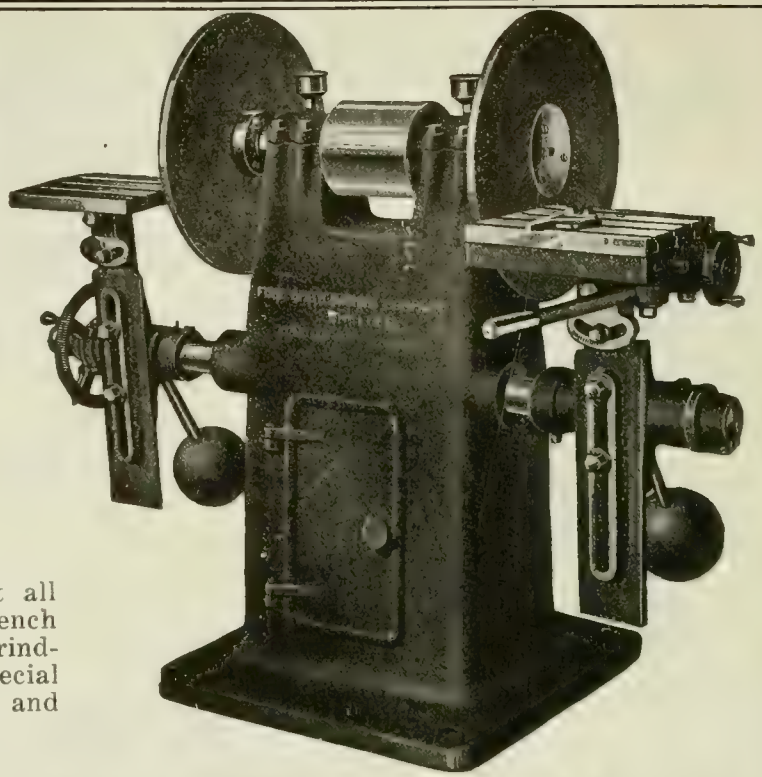
Dominion Foundries & Steel, Limited
HAMILTON, ONTARIO

If interested tear out this page and place with letters to be answered.

FORD-SMITH

DISC GRINDER

This carefully built Disc Grinder has solved the problem of economic production for many a manufacturer. It will do likewise for you. Grinds surfaces accurately and at small cost. It is a modern high-speed production tool.



There's a Ford-Smith Grinder to meet all your requirements—Floor Grinders, Bench Grinders, Water Tool Grinders, Swing Grinders, Motor Driven Grinders and Special Grinding Tools. Buffers and Polishers, and Swivel Tables.

THE FORD-SMITH MACHINE CO., LIMITED
HAMILTON, CANADA

FOREIGN AGENTS: W. E. Storey, London, England. Gollin & Co., Melbourne, Australia. British & Canadian Hydraulic Tube Co., Johannesburg, S.A.

Dominion Wheels

As Good as Grinding Wheels can be Made

Dominion Wheels are made from Abrasives from our own furnaces. Thus we guarantee every wheel to be uniform in quality. Specify Dominion Wheels in your next order and watch results.

DOMINION ABRASIVE WHEEL CO., Ltd., Mimico, Ont.

BROWN-BOGGS

B B

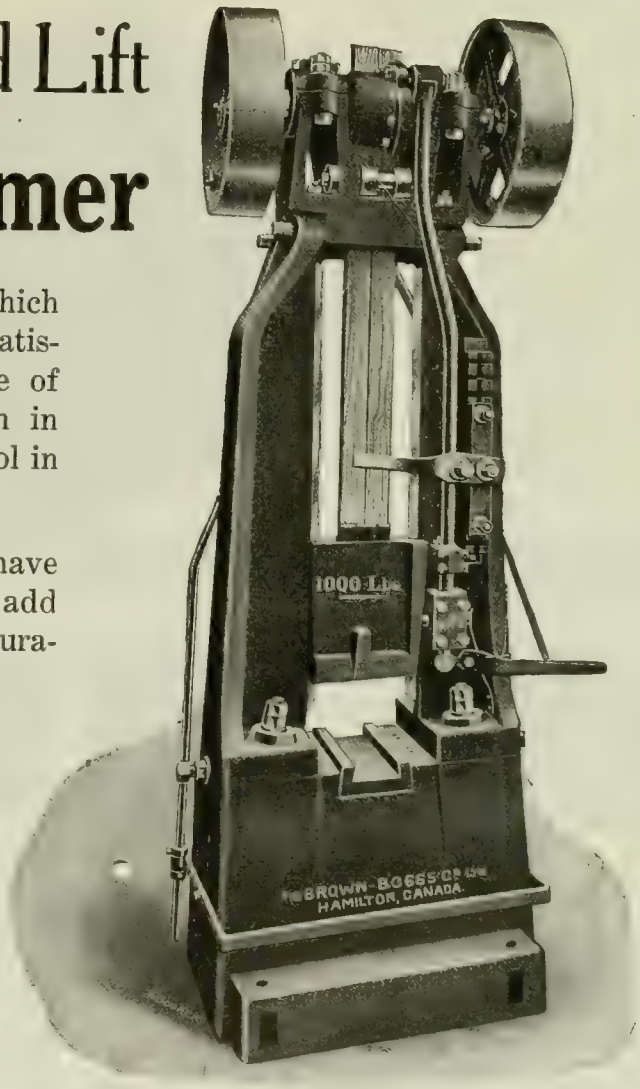
1000 lb. Board Lift
Drop Hammer

It pays to choose machinery which has a reputation for giving long, satisfactory service. The excellence of Brown-Boggs products is shown in the results which every "B-B" tool in use is attaining.

The latest type "B-B" hammers have many exclusive features which add greatly to their efficiency and durability.

The old-fashioned, noisy gears have been eliminated entirely, the hammer being lifted by friction exerted by a powerful eccentric motion under perfect control of the operator at all times.

On all the sheet metal working machinery, presses, shears, rolls, etc., which you buy, make sure of the Brown-Boggs trade mark—it means **reliable service!**



THE BROWN-BOGGS CO. LIMITED
HAMILTON, CANADA.

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STEEL *for*
Every Commercial Purpose

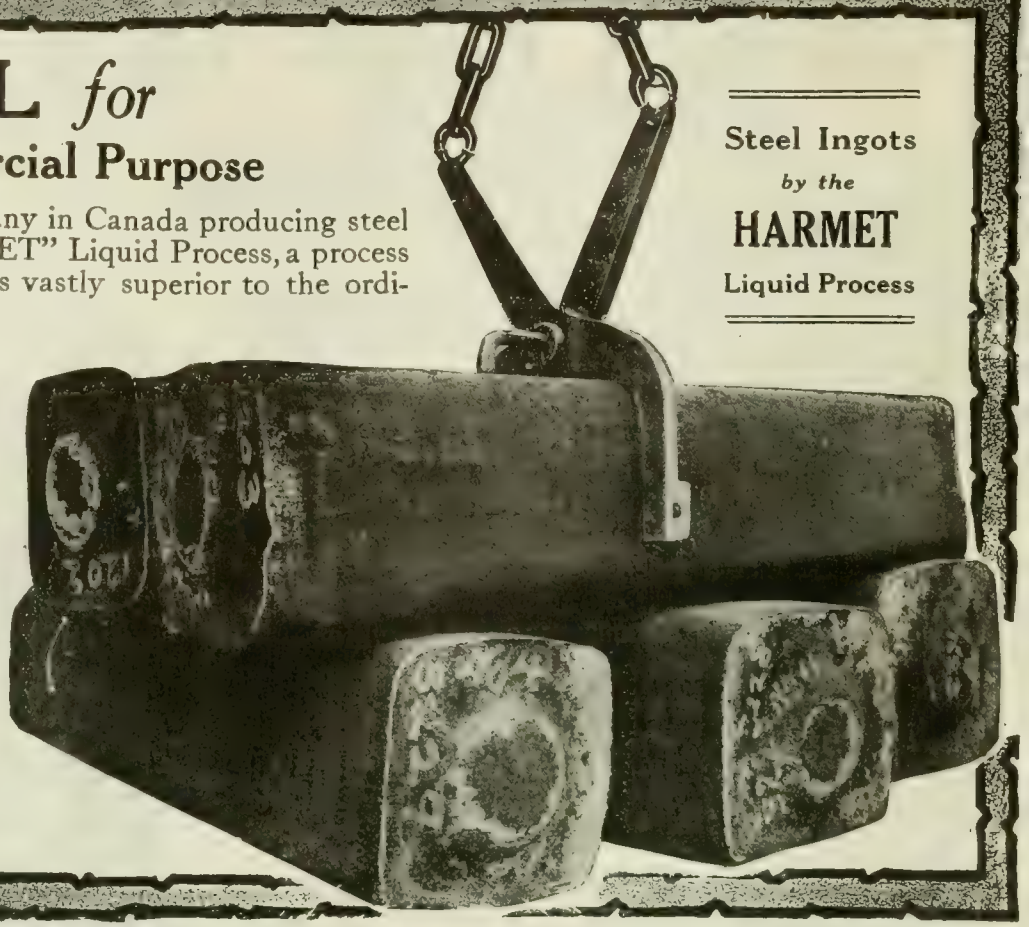
We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Offices:
New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL



Steel Ingots
by the
HARMET
Liquid Process

CANADIAN ATLAS CRUCIBLE STEEL Co. LIMITED

Made in Canada

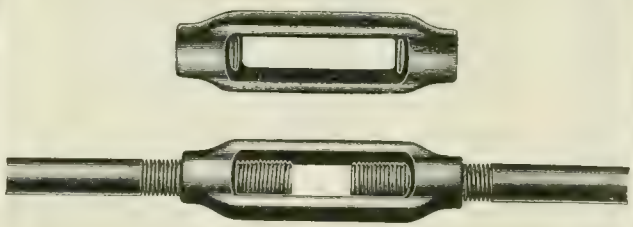
L-XX HIGH-SPEED
ATLAS TOOL STEELS
ATLAS ALLOY STEELS

Hot Rolled, Forged Blocks and Discs
Cold Drawn Steel and Drill Rod

GENERAL SALES OFFICE:
133 Eastern Avenue, TORONTO, ONT.
Works: WELLAND, ONT.
Sales Offices and Warehouses:
TORONTO, ONT. MONTREAL, QUE. WINNIPEG, MAN.

CANADA
FOUNDRIES & FORGINGS
LIMITED

Drop Forged Steel



SOLID—NOT WELDED

16 Sizes {with / without} Stubs

Canada Foundries & Forgings
Welland, Ont.

TRADE MARK

"AW" DRILLS

Milled or Twisted

From the raw materials entering the steel to the finished drill a rigid inspection is given after each operation, which assures a superior product.

High Speed Twist Drills

The Drills for MAXIMUM PRODUCTION

All Standard Sizes Carried In Stock.

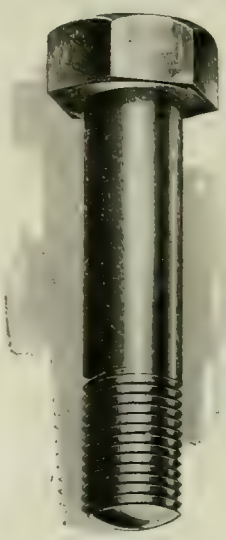
Prompt Deliveries on Special Sizes

ARMSTRONG WHITWORTH OF CANADA, LIMITED

Head Office:— 298 St. James St., Montreal

Works:— Longueuil, Que.

BRANCHES :
126 WELLINGTON ST. W., TORONTO McARTHUR BLDG., WINNIPEG



ACCURACY

Just now all jobbers should have a complete stock of SAE Cap Screws, Plain and Castellated Nuts and Taper Pins to meet the automobile repair trade requirements.

Your rush orders filled promptly by

The Galt Machine Screw Co., Limited

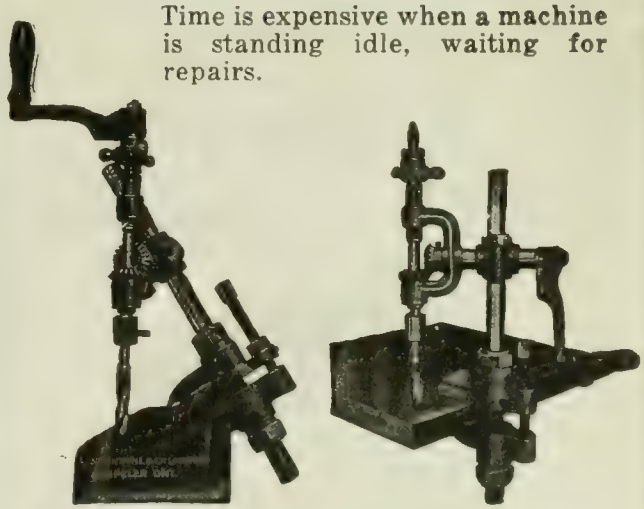
GALT, ONTARIO

Eastern Representatives:
Messrs. F. BACON & COMPANY
131 St. Paul Street West, Montreal, Que.

Western Representative:
Mr. D. PHILIP
138 Portage Avenue, Winnipeg, Man.

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

Sold by all Machinery and Supply Houses.

A. B. JARDINE & CO., Limited

HESPELER, ONTARIO

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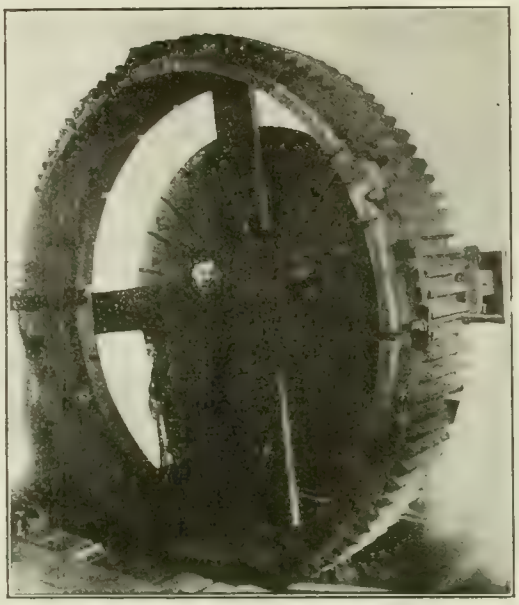
Hull Iron and Steel Foundries, Limited

HULL, QUEBEC



Specify "HISCO" Regd. Products

Steel, Chrome, Manganese and Nickel

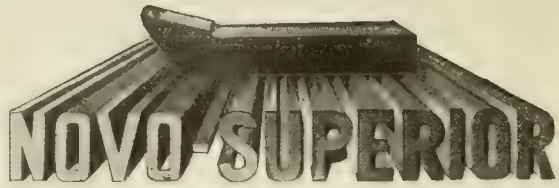
STEEL CASTINGS

Annealed and Unannealed

Cement Mill and Mining Machinery, Castings, Stamp Mills, Crushing Plants, Excavating Outfits, Steel Car Wheels, Locomotive Driving Wheels and Frames, etc.

Machine-Moulded GEARS

"HISCO" machine-moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high prices of lumber and labor is something to be considered.



HIGH SPEED STEEL

INTRA STEEL GIBRALTAR STEEL

Tool Steel for Every Purpose

Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.; Music Wire for Springs, Steel Balls, Cold Rolled Tool Steel in Strips and Sheets, Circular Saws, Machine Knives.

PILOT STEEL & TOOL COMPANY, LIMITED

332 St. James Street, Montreal

Sole Agents for

JONAS & COLVER, LIMITED
Novo and Continental Steel Works, Sheffield, Eng.

H. BOKER & CO., Inc.
New York, N.Y.

Steel Fingers Slip into The Flutes

Grip the broken tap and back it out before you've had time to count three times sixty.

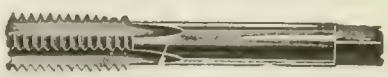
The Walton Tap Extractor

removes broken taps buried below the surface of the work without trouble or loss of time. It removes any broken tap without injuring the thread. It saves the casting or forging. Pays for itself over and over—often on the very first job.

How many do you want on trial?

The Walton Co.

Hartford - - - Conn.



THE
ACKWORTHIE
TAPPING ATTACHMENT.

BRITAIN'S PREMIER CHUCK

Made in 6 sizes.
To tap from ⅛ in. to 1¼ in. Whit.

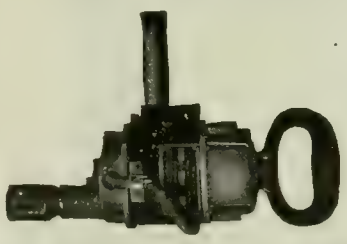
We have made some thousands of these Chucks during the last 11 years, every one of which has given satisfaction. For tapping holes there is nothing to equal them for speed and handiness.

Shall we mail you particulars?

J. ACKWORTHIE, Ltd.
Coleshill Street,
BIRMINGHAM

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

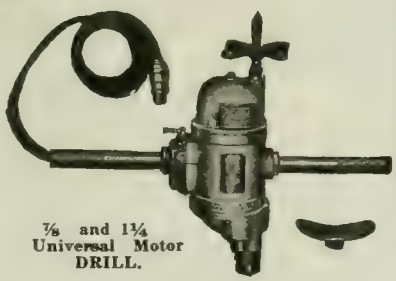
For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs.
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞ and 1¼ Universal Motor DRILL.

For Sale By
The Canadian Fairbanks-Morse Co., Limited
Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO

Examine the Grain!

A properly alloyed babbitt has a perfectly uniform grain.

Break a bar of the babbitt you are using—

If you find the grain irregular—if it shows a mixture of fine and coarse particles—if it shows a separation of layers—one dark and one light in color—

then you may know that it is poorly alloyed—and that you can get far better wear from

Lionroyal

produced by the STANLEY PROCESS of alloying.

Lionroyal is clean—uniform—dense grained—and durable.

It is copper-hardened and tin-toughened. Bearings lined with it carry the load evenly—every inch of bearing surface equally durable.

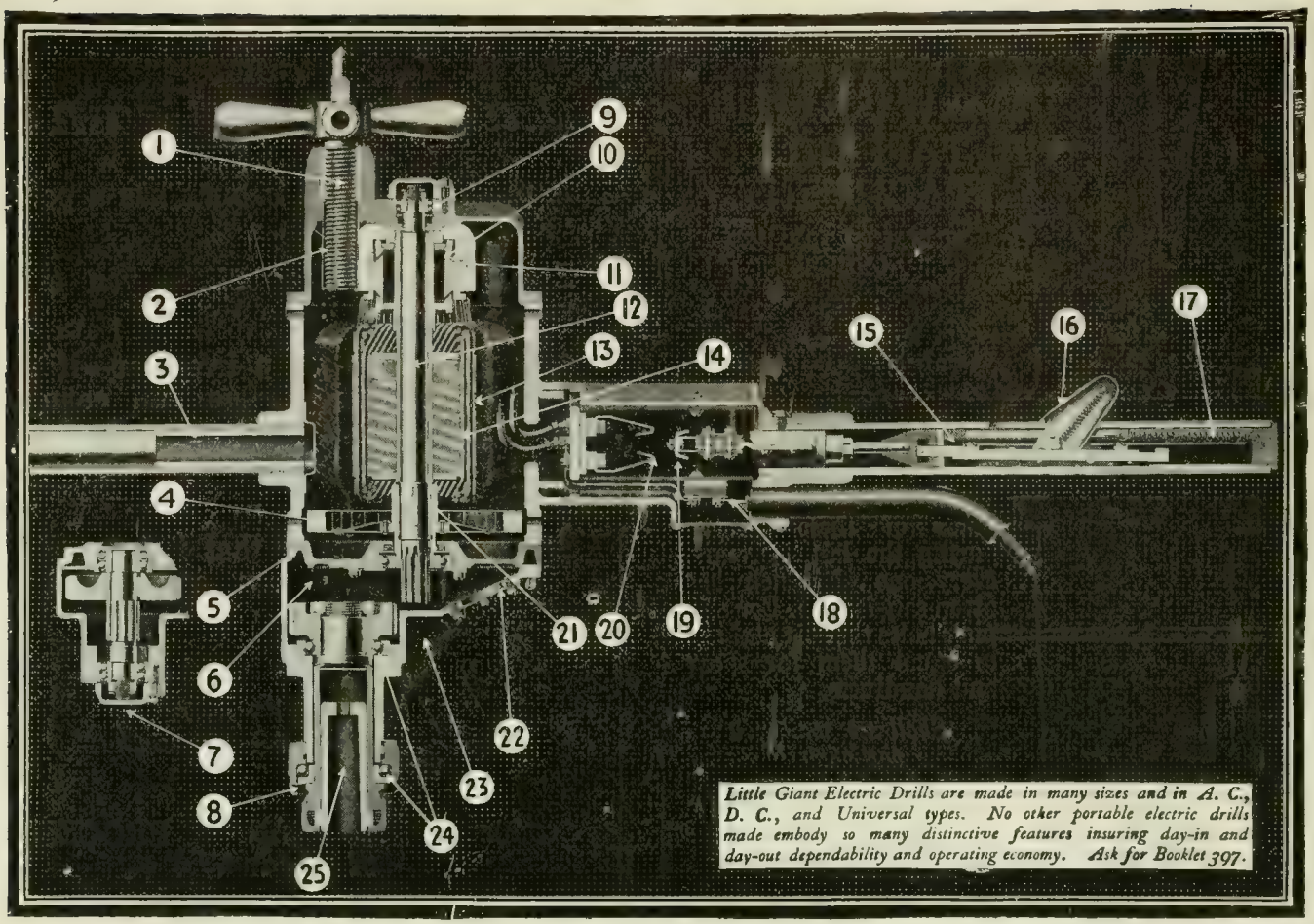
It has no hard spots of copper or antimony, because the hard elements are thoroughly and uniformly amalgamated with the tough elements. This fact bespeaks steady service and long wear.

Write for Booklet "AB" to know more about pouring and using Babbitt.

BRITISH SMELTING & REFINING COMPANY LIMITED

MONTREAL

If interested tear out this page and place with letters to be answered.



Little Giant Electric Drills are made in many sizes and in A. C., D. C., and Universal types. No other portable electric drills made embody so many distinctive features insuring day-in and day-out dependability and operating economy. Ask for Booklet 397.

Inside Information

why Little Giant Electric Drills accomplish results

1 **Long feed screw** entering into body of supporting bracket, thus giving same results as telescopic feed.

2 Protecting sheath, preventing entrance of dirt into drill if feed screw is removed.

3 Dead handle reinforced at point of greatest strain.

4 Sheet steel fan, carefully balanced and reinforced, pro iding thorough ventilation.

5 Solid transfer plate or diaphragm preventing grease or oil in gear case from entering windings.

6 Liberal grease compartment for providing reliable lubrication of gears and ball bearings.

7 Section thru intermediate gears. Note wide *double* row of ball bearings at each end of gear shaft (used on large drills). Pinion and gears made of special alloy steel carefully heat treated.

8 Dust protector for excluding dust from lower thrust ball bearing.

9 Ball bearing easily accessible for lubrication and inspection.

10 Commutator of sturdy design and construction, thoroughly insulated with mica.

11 Large opening with well secured and readily removable cover plates providing easy access to brushes and commutator.

12 One-piece armature shaft and pinion of tool steel, hardened and ground, insuring perfect alignment of pinion at all times. On large size drills armature shaft is removable from the armature core and commutator, which are mounted jointly on a quill or spider.

13 Laminated pole pieces, minimizing pole face losses (used on large drills).

14 Armature coils form wound, heavily insulated, and carried in insulated slots in armature core. After winding and connecting to commutator, coils and armature are again dipped in insulating varnish and baked.

15 Quick acting control switch, making slow break impossible and preventing destructive burning of contacts.

16 Conveniently located trigger for operating switch.

17 Safety return spring for automatically opening switch when operator removes hand from switch handle (used on large drills).

18 Terminal block for cable, permitting ready removal of cable without disturbing other connections.

19 Cover plates on each side of switch, providing easy access to switch contacts.

20 Double pole, double break switch. Rugged contacts are readily removable.

21 Long fan-hub of high grade steel, hardened and ground. Press fit on shaft with long key insures permanent rigidity.

22 Cover plate quickly removable for inserting grease in gear case.

23 Reinforcing rib on gear case, insuring proper strength and rigidity.

24 Combined annular and thrust bearing at each end of spindle.

25 Removable socket inserted in spindle. Driving lugs on socket milled from the solid.

Sales Representatives

The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street EL-35-H

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · VACUUM PUMPS · PNEUMATIC HOISTS
GIANT OIL AND GAS ENGINES ROCK DRILLS · COAL DRILLS

LITTLE GIANT

Electric *Tools*

FOR LARGER WORK AND GREATER PRODUCTION

POTTER & JOHNSTON 8B—AUTOMATIC

Specifications

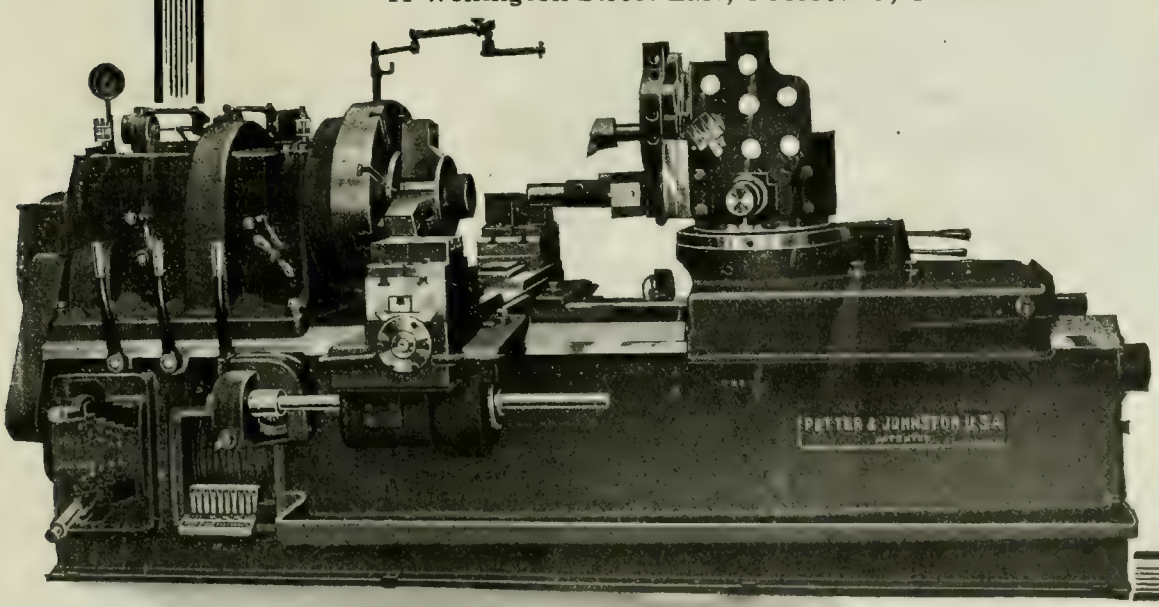
Swing Over Bed	35″
Swing Over Cross Slide	24″
Travel of Cross Slide (Front and Rear Separate)	10″
Number of Turret Faces	4
Diameter of Holes in Turret	3″
Depth of Holes in Turret	4½″
Distances from Centre of Turret Hole to Top of Turret Slide	5″
Maximum Turret Slide Travel	28″
Turret Feed	28″
Length of Turret Slide Travel which permits of Supporting or Piloting Turret Boring Tools	13½″
Turret Slide Adjustment	13
Front Spindle Bearing	7¾″ dia. by 7″ long
Rear Spindle Bearing	5 5-16″ dia... by 5″ long
Diameter of Hole through Spindle	6″
Size of Geared Scroll Chuck furnished with Machine	24″

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

HEAD OFFICE AND SHOW ROOM

11 Wellington Street East, TORONTO, CANADA



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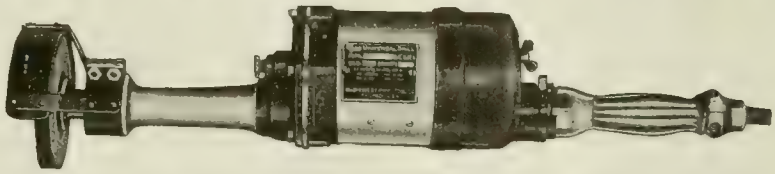
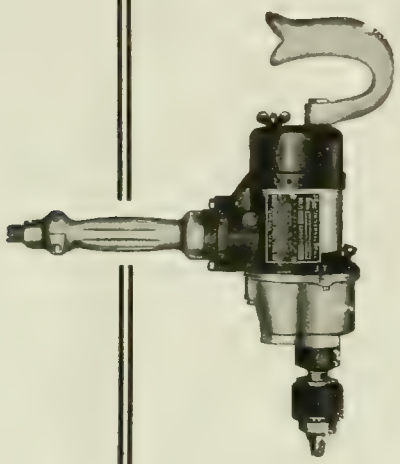
tools for Your Plant

Thor



PORTABLE ELECTRIC DRILLS



Drills unequalled for power at their weight; motors, hand wound, triply insulated, all encased in light aluminum. The result is drilling power when needed, right from the nearest electric light socket. Many plants using air tools have a number of sturdy electrics to handle the special jobs away from the air line. Others have standardized in speeding up production with THOR electrics.

THOR Electric Tools include 8 sizes of Portable Drills, with drilling capacity in steel, ranging from ¼″ to 2″; and a Portable Grinder with 4″ wheel. Get three or four THORS for demonstration on your work. Until you are convinced of THOR quality, you are not obligated.

The THOR line also includes a complete list of Portable Pneumatic Tools.

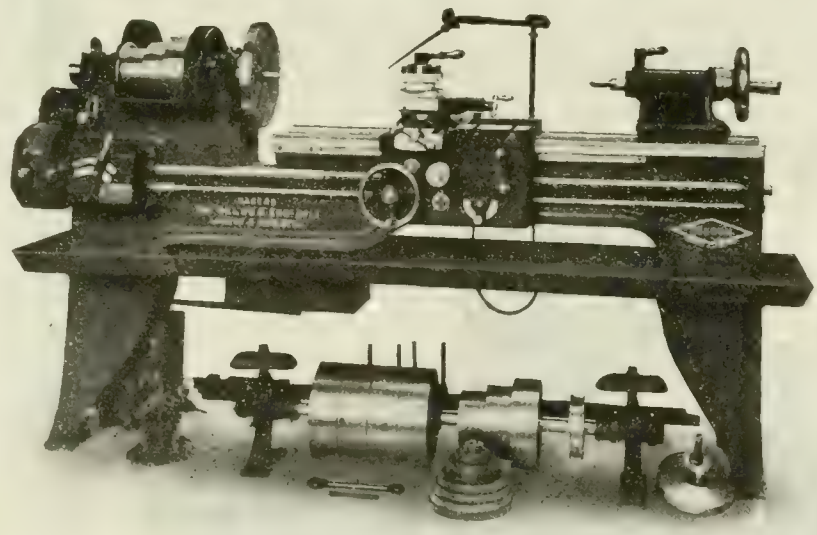
Full details upon request.

INDEPENDENT PNEUMATIC TOOL CO.
600 W. Jackson Blvd. Chicago

334 St. James St., Montreal.
32 Front St. West, Toronto.
123 Bannatyne Ave. E., Winnipeg.
1142 Homer Street, Vancouver.

The "SELSON" High-Speed, Vee Bed Gap Lathe

13" Swing



A Canadian once told us that he liked American lathes for their handiness and British for their durability. This sentence struck us, and therefore, we designed the 13" lathe.

SELSON

Engineering Co., Ltd.

SELSON HOUSE, 83 and 85 QUEEN VICTORIA STREET
LONDON, E.C.4, ENGLAND. WORKS: COVENTRY

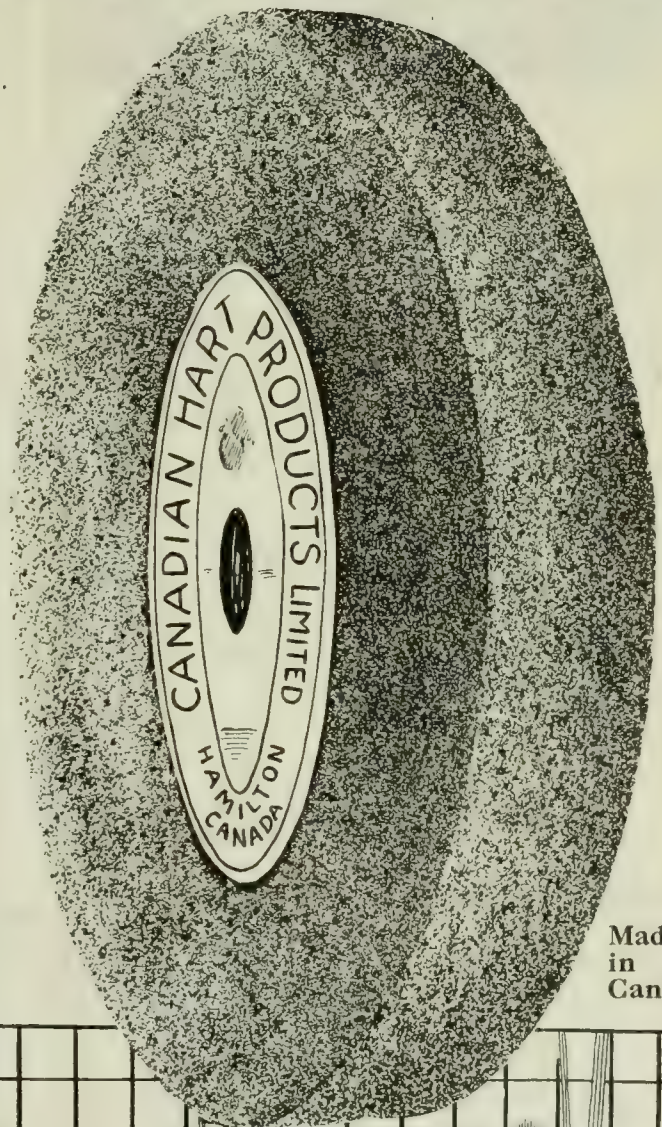
Branches: Paris, Brussels, Turin, Milan, Melbourne, New York

CANADIAN HART GRINDING WHEELS

THE factory tests that all Canadian Hart Wheels are subjected to gives you an absolute guarantee that they are free from defects. Each wheel is also carefully inspected for size, grain and grade, so as to make certain that every wheel is in accordance with specifications on your order.

Canadian Hart Wheels are not inclined to "gum up" or "glaze," because they are made of proper abrasive grains of a suitable degree of hardness; especially is this true when the buyer secures the co-operation and advice of our engineering staff with a view of getting the right wheel for the job.

How can we serve you?



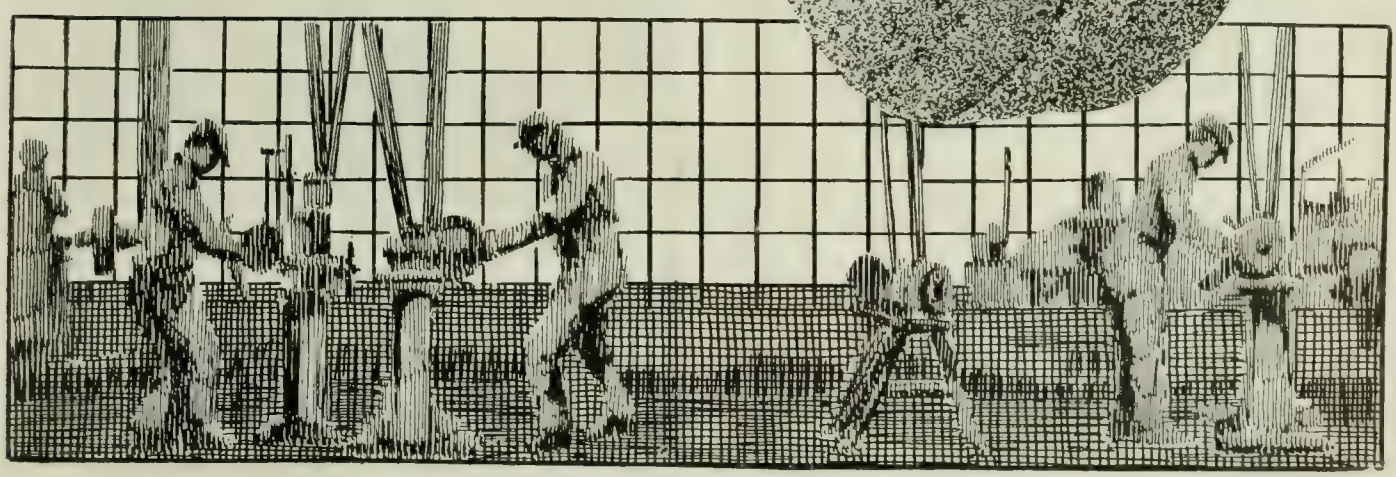
Canadian Hart Products

LIMITED

Manufacturers of Grinding Wheels and Machinery

Hamilton, Canada

Made in Canada



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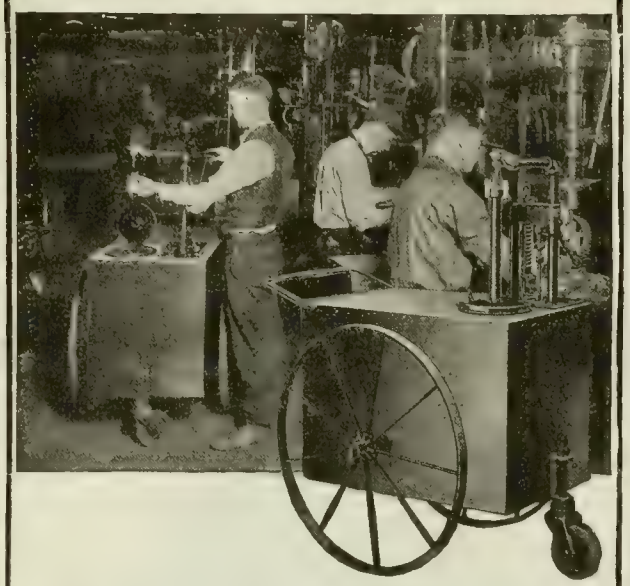

Take the Oils To The Machines

In a Bowser Portable Outfit and save Mechanics' time. Keep machines working and increase production.

Minutes spent by men in the oil room are wasted—lost. Your men don't want to lose those minutes. The old oil storage simply forces them to do it.

BOWSER
ESTABLISHED 1885

Oil Storage Systems

prevents these losses, bring a day's supply of oil to the machines—no loss of time or oil. Workmen enjoy the convenience and safety of Bowser equipment—employers appreciate the actual money saving effected.

OUR LITERATURE EXPLAINS WHY
WRITE FOR IT

S. F. BOWSER COMPANY,
LIMITED
66-68 Fraser Ave., TORONTO, CANADA
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STEEL CASTINGS

QUICK DELIVERIES

High Carbon Steel
Manganese Steel
Chrome Steel
Mild Steel

QUALITY GUARANTEED

Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS,
LIMITED
OWEN SOUND, ONTARIO
ESTABLISHED 1860

DROP FORGINGS
Are sometimes cheaper than castings—Always far superior.

DROP FORGINGS

One of the Largest and Best Equipped Plants anywhere.

Consult us as to your requirements.

Dominion Forge & Stamping Co., Limited
Walkerville, Ontario
Toronto Office · Excelsior Life Building

DIAMOND TOOLS

FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION

INDUSTRIAL GEMS

Tools For All Mechanical Purposes

FURNISS CLARKE & COMPANY

364 University St.
MONTREAL

Sole Canadian Agents for

THE JOYCE-KOEBEL COMPANY, INC.

Formerly Geo. A. Joyce Co., Ltd.

NEW YORK LONDON

New Air-Tight Blast Gates

will help you maintain the safety, economy and efficiency so essential in the operation of furnaces and other appliances using low or moderate pressure air.

THEY ARE SAFE— because they are ruggedly built of only a few simple parts; the blade stays fixed in any position and by a slight pull of the handle is easily adjusted to give the blast desired.

THEY ARE ECONOMICAL—because the initial cost is small; the simple construction eliminates wear and tear.

THEY ARE EFFICIENT—because careful machining makes them AIR-TIGHT; they afford the full area of the blast pipe, in striking contrast to a stop cock; they are quick in operation; they can be placed in any position.

In short, these New Air-Tight Blast Gates possess all the advantages of stop cocks and valves, and have special features that tend for greater usefulness and economy.

SIZES 2" TO 16"

Write for Bulletin 210-T

W. S. ROCKWELL COMPANY

Furnace Engineers and Contractors
50 Church St., New York

Canadian Distributers:
Drummond, McCall & Co., Limited, Montreal

SHEPARD
ELECTRIC CRANES & HOISTS

This "Shepard" reaches every point outdoors and indoors

A Shepard Crane travels the length of the yard, and a Shepard Cage-Controlled Hoist operating on the I-Beam track of the crane covers the width. In this manner a load can be picked or lowered at any point in the yard.

The crane can be run opposite and connected with the overhead Monorail trackage that extends throughout the plant. Here the hoist and load can be run on to the track that makes accessible the various departments indoors.

This equipment is a big aid to production and expedites the necessary rehandling between departments.

Shepard Traveling Cranes are made in capacities of 1 to 50 tons, Electric Hoists and Monorail Cranes ½ to 30 tons.

The advice Shepard engineers are able to offer will prove helpful if you are contemplating a faster and more economical method of rehandling.

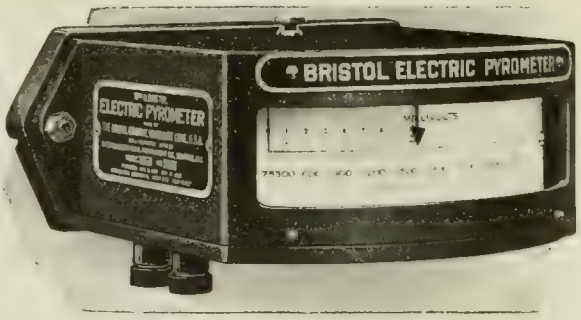
Shepard Electric Crane & Hoist Co.

426 Schuyler Ave., Montour Falls, N.Y.

Canadian Representative:
Rudel-Belnap - Montreal

Agents in Principal Cities

Member Electric Hoist Manufacturers' Ass'n.



ELIMINATE GUESS WORK
In Heat Treating

Heat-treating Furnaces equipped with BRISTOL'S Pyrometers assure perfect heat treated products through the elimination of all guess work.

The Patented Automatic Internal Cold End Compensator is an exclusive feature with Bristol's Pyrometers. It makes of every pyrometer a direct-reading instrument—no allowance to be made for cold end errors.

Get copy of Bulletin I-291.

THE BRISTOL COMPANY
Waterbury, Conn.
Canadian Distributors: A. H. WINTER JOYNER, Toronto and Montreal

LA SALLE
Has an Advantage Over Other Grinders

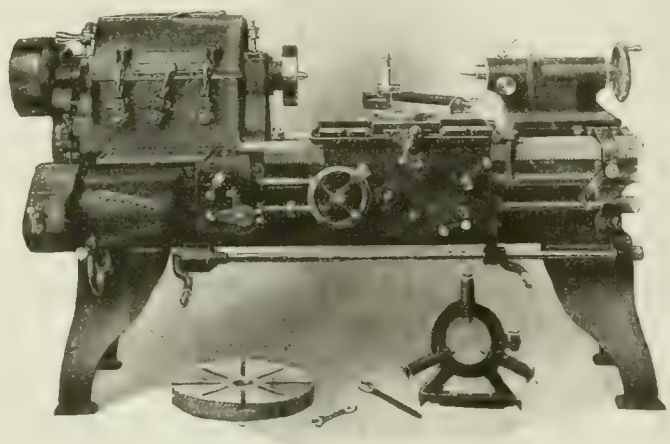
There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.

American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

LA SALLE TOOL CO.
La Salle, Illinois, U.S.A.
Represented in Canada by
A. R. Williams Machinery Co., Ltd.
64-66 Front Street W., Toronto
Halifax St. John, N.B. Montreal Winnipeg Vancou ver

The "Lehmann" Improved Selective Head Lathes
(Patents Pending)
SIZES—14" to 24" SWING

On account of its simplicity of construction, great driving power and rigidity, ample range of speeds, moderate tooth travel of its gears, compact and shapely appearance, the "LEHMANN" Selective Head Engine Lathe stands to-day in a class *ahead* and *alone*. Some of the features of construction are:



Sixteen Spindle Speeds in correct geometrical progression obtained with the use of only ten gears.

Improved Friction Clutches (Patents Pending) running in oil, requiring no adjustment and giving forward and reverse control to spindle.

Heat-treated or Hardened Steel gears.

All Shafts, except spindle, running on ball bearings.

Spindle of alloy steel, hardened and ground at the bearings and running in phosphor bronze boxes.

Head Casting forms oil-tight case enclosing all running parts.

In addition these lathes embody all features such as the patent quick change mechanism, the tailstock spindle locking device, the rod and screw shift, etc., forming part of the "LEHMANN" Cone Head Lathes which have acquired an enviable reputation for accuracy and production.

Let us describe more fully this Exceptional Lathe and its Distinctive Advantages

Lehmann Machine Company - St. Louis, U.S.A.
Chouteau Avenue at Grand

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

HENRY & WRIGHT

Drilling Machines

A tremendous increase in the understanding of drilling for manufacturing always follows the use of all
Henry and Wright Machines
Class K
Number 5

The Henry & Wright Mfg. Co.

Hartford, Conn.

New York Office: 136 Cedar Street

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co, Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

WHY EXPERIMENT ?

WE DID IT FOR YOU YEARS AGO

IMPERIAL GENUINE

For Heavy Engines and Extraordinary Hard Work

HARRIS HEAVY PRESSURE

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.

Matchless

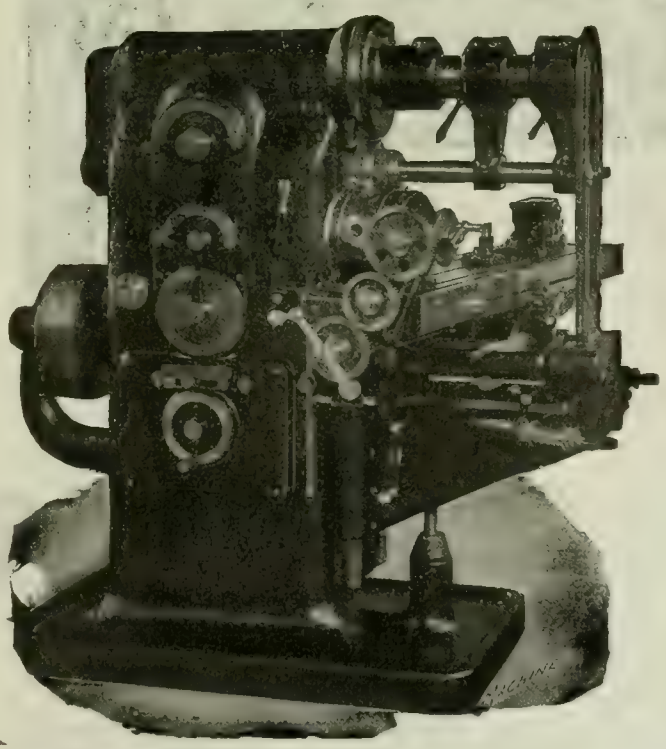
Suitable For Slow-Moving Bearings

Write For Prices

THE CANADA METAL CO., LIMITED

TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

For work requiring the utmost accuracy—



ROCKFORD MILLERS

have established an enviable reputation among prominent manufacturers for accuracy, simplicity in construction and ease of operation. That they have been able to do this is credited to the great care exercised in their design, and the high-grade workmanship used in their construction.

All feeds on the Rockford are controlled by one lever — the main spindle is instantly adjustable by a single nut, and the operator can complete a job without leaving the front of his machine. These are a few of the points that have made the Rockford a favorite with the men as well as their employers. We would like to tell you more about these machines. Write us for full information.

Rockford Milling Machine Co.

Rockford, Ill.

Canada: Rudel-Belnap Machinery Co.

Toronto, Ont.

FOREIGN REPRESENTATIVES:—Great Britain, A. A. Jones & Shipman, Ltd., Leicester, England. France and Belgium, Louis Besse, Paris, France. Italy, and Colonies, Societa Anonima Adler & Co., Milano. Scandinavia, Rylander & Asplund, Stockholm, Sweden. Spain, and Portugal, Casamitjana Hermanos, Barcelona, Spain. Australia, Selson Engineering Co., Melbourne, Australia. Russia, M. Mett Engineering Co., Petrograd, Russia.

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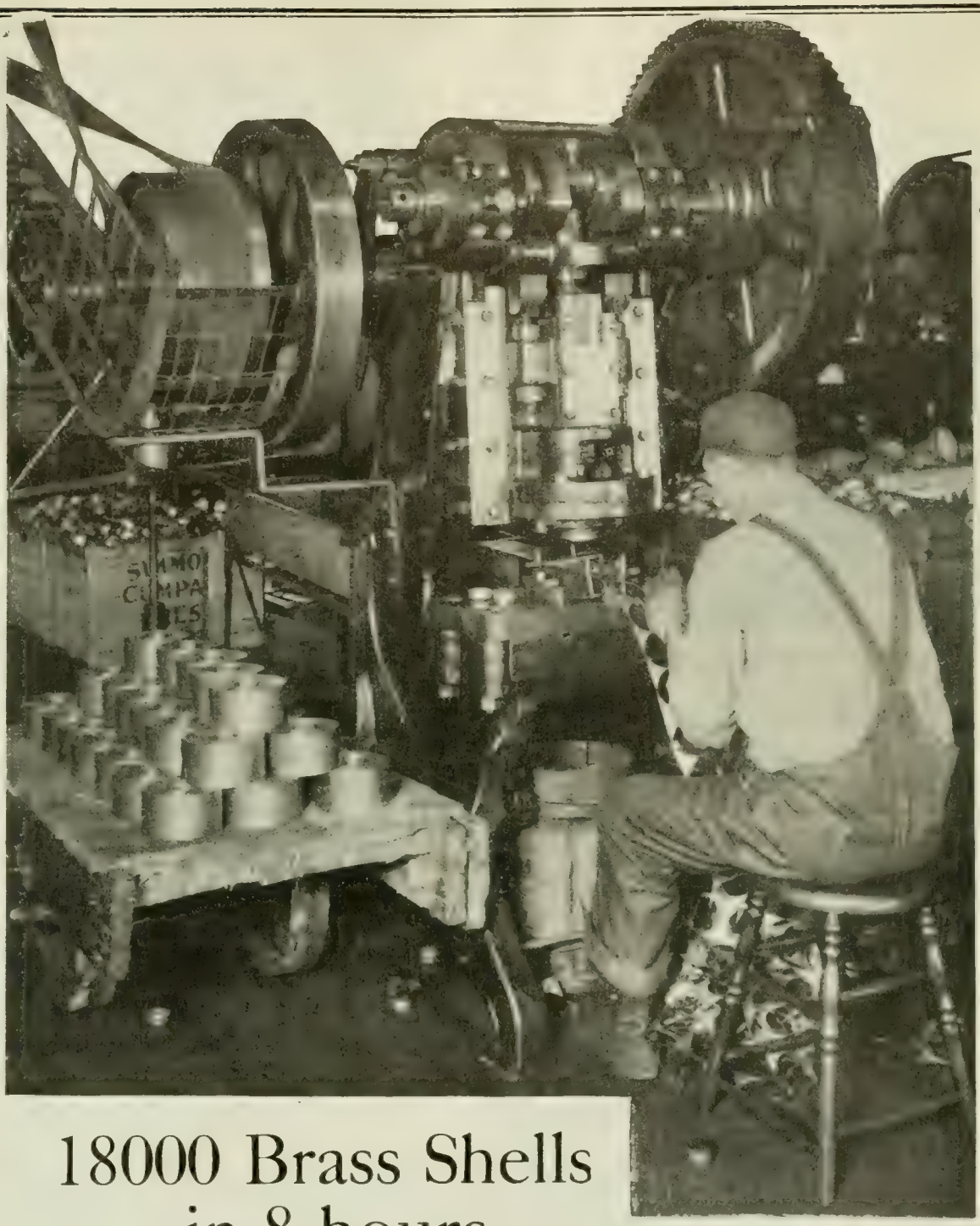

18000 Brass Shells in 8 hours

is the operator's record output on this "BLISS" No. 68-N Cam Drawing Press working on top mounts for brass bedposts for the Simmons Company, Kenosha, Wis.

BLISS 1857

E. W. Bliss Company

BLISS 1921

Main Offices: BROOKLYN, N. Y., U. S. A.

American Factories: BROOKLYN, N. Y.; HASTINGS, MICH.; CLEVELAND, O.; SALEM, O.

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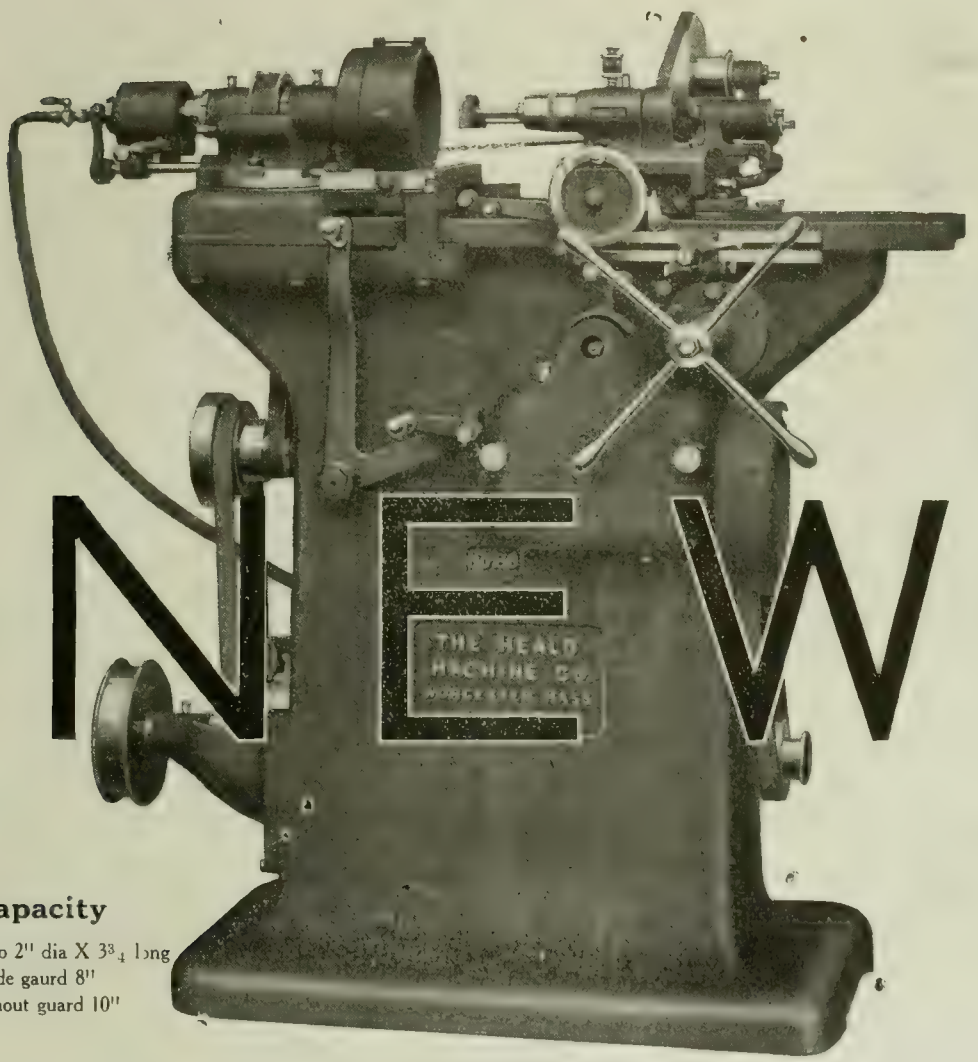
FOREIGN SALES OFFICES

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S.E. PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen

112

HEALD Power Feed Internal For Small Work



Capacity

Holes 1/4 to 2" dia X 3 3/4 long
Swing inside gaurd 8"
Swing without guard 10"

A rugged machine for precision grinding of small work. It is modeled on the lines of the very successful Style No. 85 having all its mechanical features and in addition is equipped with power feed for table. This is very desirable for work with close limits, small diameter and the length of which makes it preferable to have the power feed for the table travel.

A unique feature of this machine is the vertical pinion for driving the table which is equipped with a double friction of simple but durable construction. By simply throwing a lever, either of these frictions may be engaged at the will of the operator. In one position the machine may be used with the automatic features, in the other it becomes hand feed.

We would like to send you a bulletin on this machine or catalogue of our entire line

THE HEALD MACHINE CO.

51 NEW BOND STREET
WORCESTER, MASS.

Branches at: Chicago Detroit Cleveland Buffalo New York Cincinnati Philadelphia

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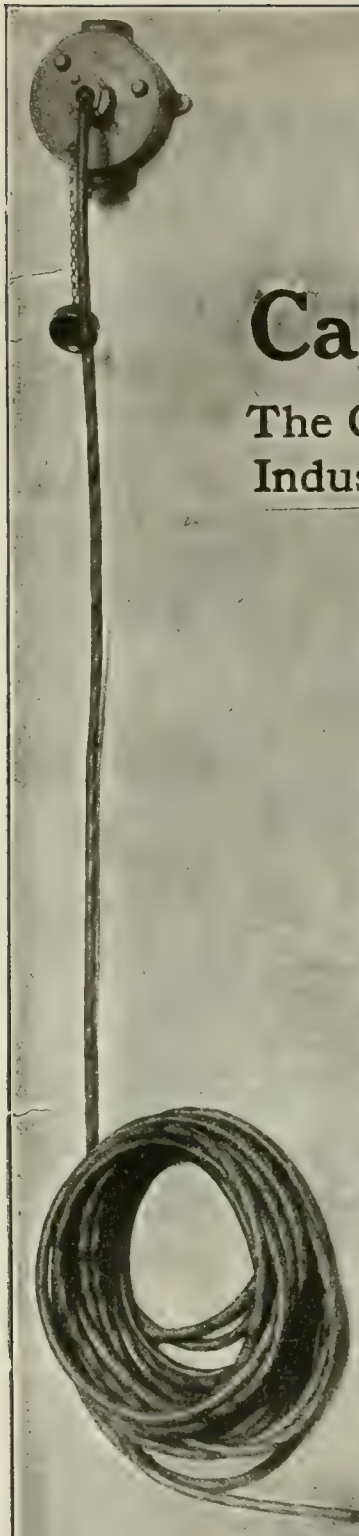

Cab Tire Cable

The Cable De Luxe for Industrial Purposes

This advertisement illustrates:

A length of Northern Electric Cab Tire Cable
One Northern Electric No. 511 Marine Plug and Receptacle
One Northern Electric No. 300 Hand Portable

This combination is ideal for Industrial Portables. It is especially adapted for use in damp localities, or where gas or oil fumes abound, and where other types of cable would be subject to mechanical injury.

Because of its flexibility and durability, Cab Tire Cable is in a class by itself for industrial purposes, and the ever-increasing orders received from Machine Shops and Industrial Plants all over Canada prove its merit and popularity.

Our nearest house will give your inquiries immediate attention.

Northern Electric Company
LIMITED

MONTREAL QUEBEC TORONTO LONDON REGINA EDMONTON
HALIFAX OTTAWA HAMILTON WINDSOR WINNIPEG CALGARY VANCOUVER

NAMCO

HARDENED AND GROUND SCREW MACHINE PARTS

Special

Screw machine product up to 2¼ in. diam.—to specifications. Hardened and ground screw product—to specifications.

Standard

V. & U. S. S. Semi-finished Nuts
V., U. S. S. & S. A. E. Cap Screws
V. & U. S. S. Set Screws
S. A. E. Plain and Castellated Nuts.

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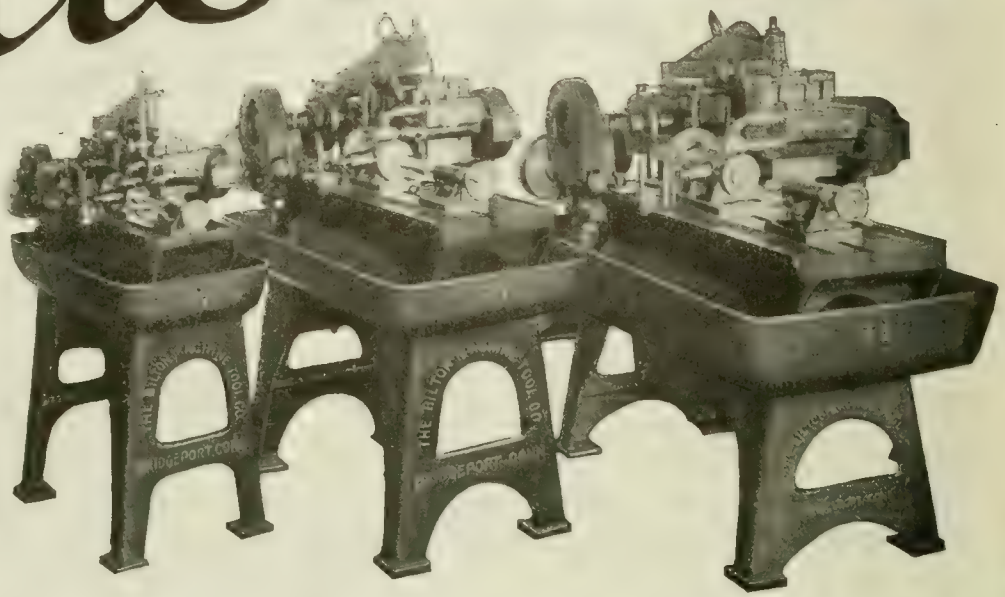

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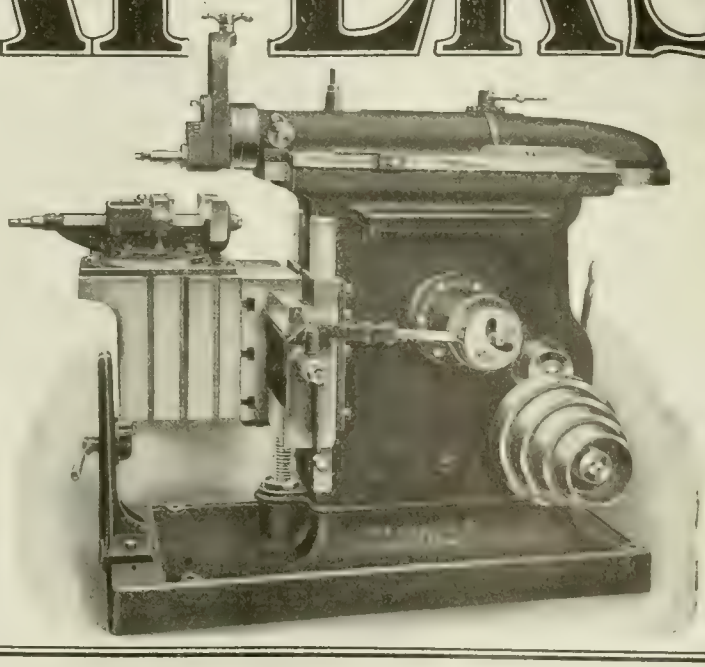

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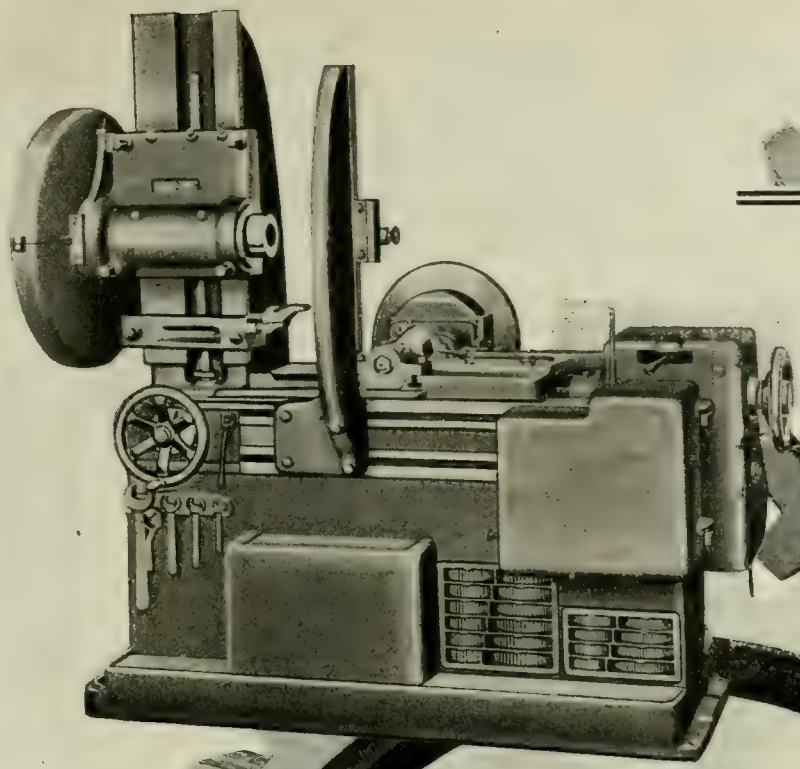

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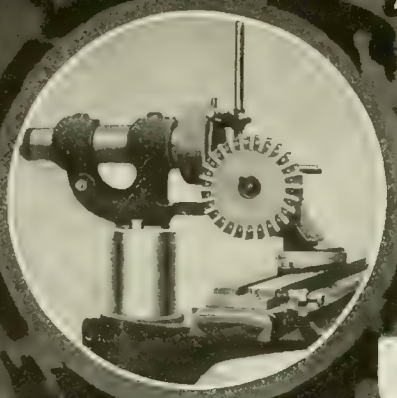
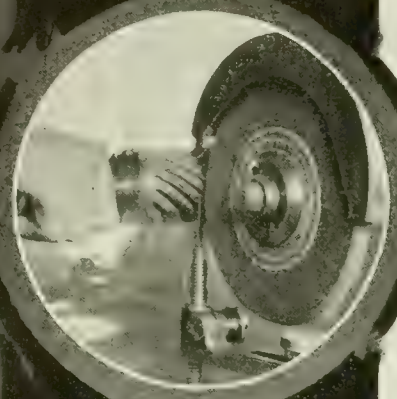
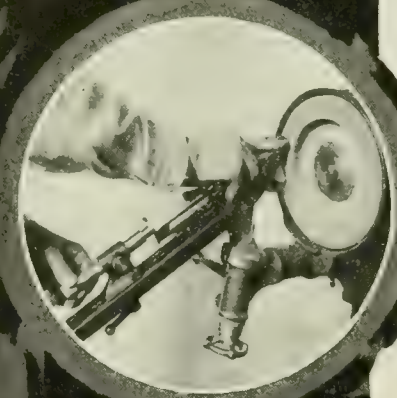
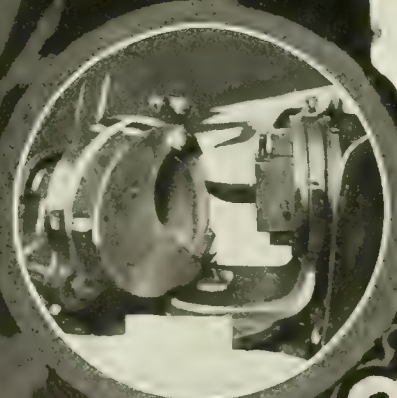
Tool Room Work









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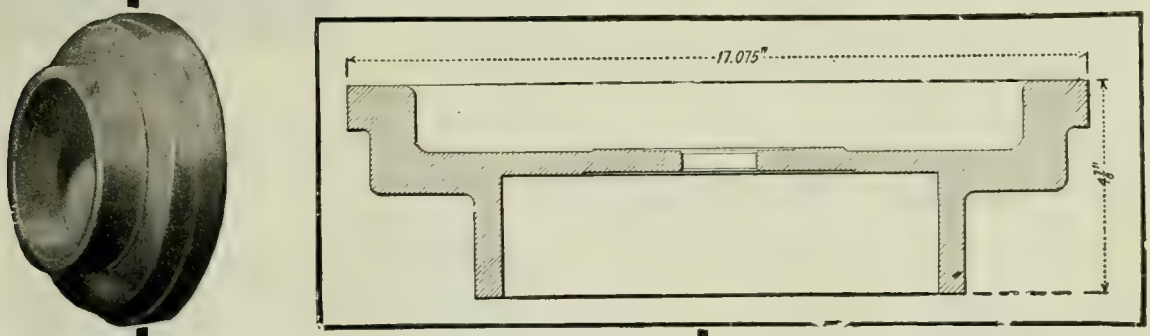

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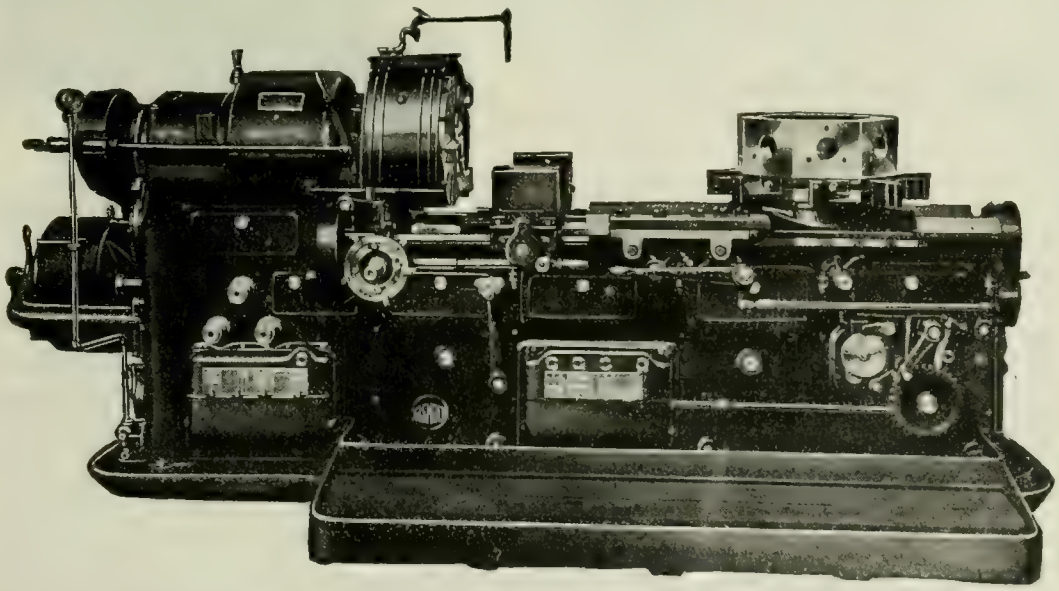

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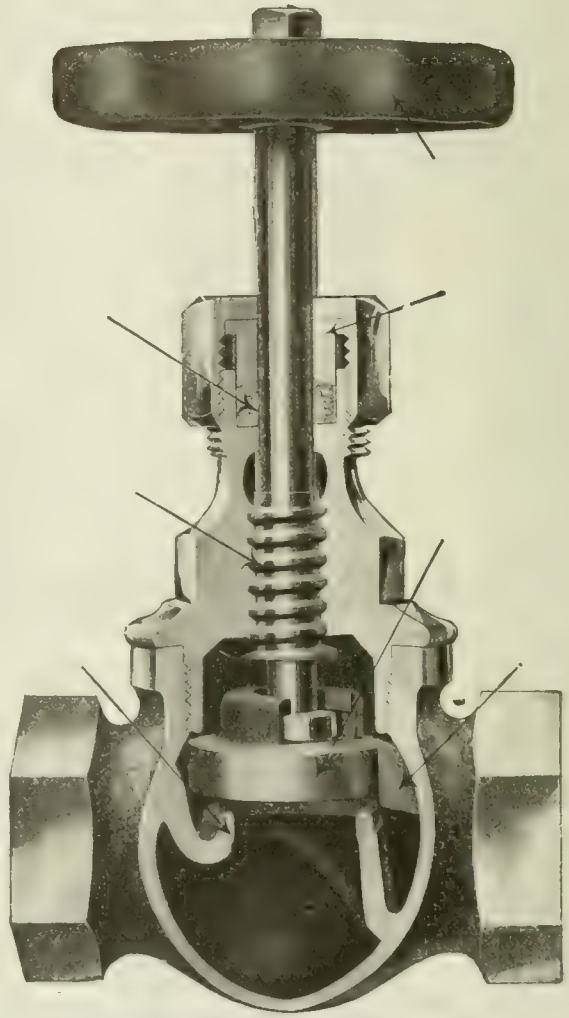

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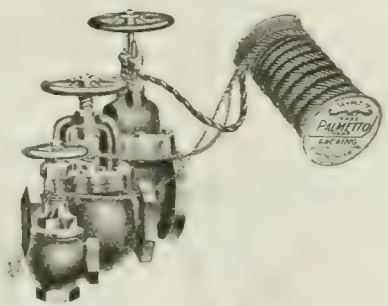

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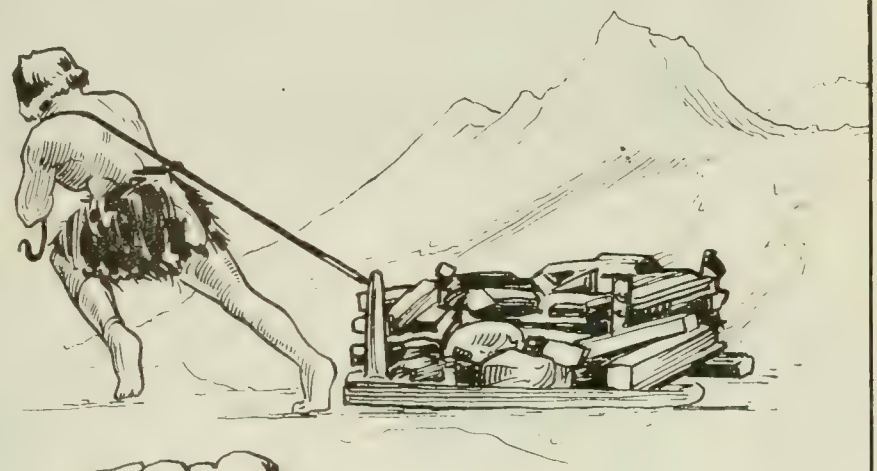
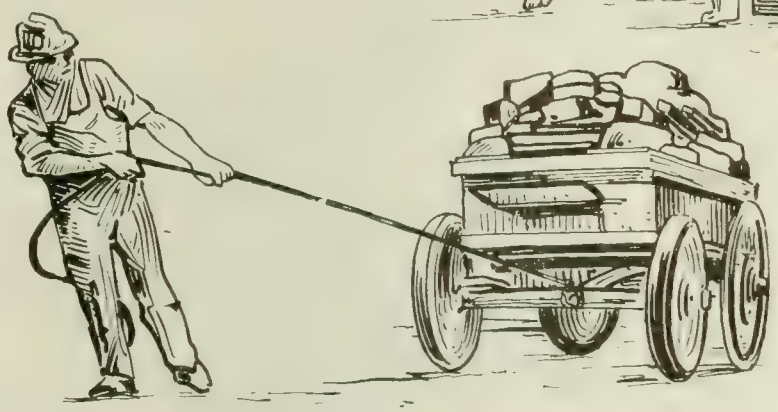
CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 11 March 17, 1921

Application of Ball Bearings to Machine Tools





Motors — Fans — Countershafts—Worm Drives—Saws — Grinders — Shapers and Lathes. Method of Applying Ball Bearings to These Machine Tools

By Gordon Janes

IN the Feb. 24th issue of Canadian Machinery there appeared an article dealing briefly with the history of ball bearings, from that point leading up to the actual installation of the same. In the present article we shall go into the mounting and installation of such bearings, illustrating wherever possible the sectional view of the equipment.

Annular Bearings

In mounting annular bearings, care must be taken that the inner race is a permanently tight fit on the shaft; otherwise the continued action of the load, concentrated on the short shaft length corresponding to the bearing width, will, in time, peen down the shaft. It is unwise to place reliance on a drive fit alone, as they may be destroyed by an occasional dismounting, or by the action referred to above. Binding the inner race endwise between a substantial shoulder and well set up nut creates a frictional grip on the shoulder and nut faces that prevents the transfer to the shaft surface of the destructive influences cited. This binding action forms an excellent substitute for bearing seat length. Neglect in this direction results more generally in damage to the shaft, but occasionally to the bearing as well.

The outer race should be a sucking fit in the housing. If this race be fixed against rotation, the load always comes in the same place; but if allowed to take up a different position from time to time, new sections of the race are constantly coming under the influence of the load. A sucking fit of the race will be accompanied by a slow intermittent creep under the slight vibrations of the load. In order not to prevent this beneficial creep, the sides of the outer race should never be absolutely clamped, even when the race is held between shoulders to prevent end movements of a shaft. A slight clearance of 1/100 of an inch, or as much as is admissible, should be left on each side.

If the outer race is a tight or driving fit in the housing, it is impossible, in assembly, to be sure the bearing is not assembled out of line, due to the narrow width of the bearing compared with the diameter. In fact, it is nearly a certainty the outer race will be cramped or out of line when assembled under such conditions, with the consequently rapid destruction of bearing races and balls. Such bearings will appear as if subjected to a heavy end thrust and overloaded. Fig. 15 (shown in February 21st issue) illustrates the correct method of mounting a shaft on ball bearings, bearing B restraining the shaft against end wise motion, and bearing A being free to move axially in the housing.

Thrust Bearings

When mounting self-aligning thrust bearings on vertical shafts, it is advisable to give the aligning washer some freedom of sidewise movement to permit it to assume its best position in case of shaft oscillation. With such a freedom allowed, the shaft should be a snug fit

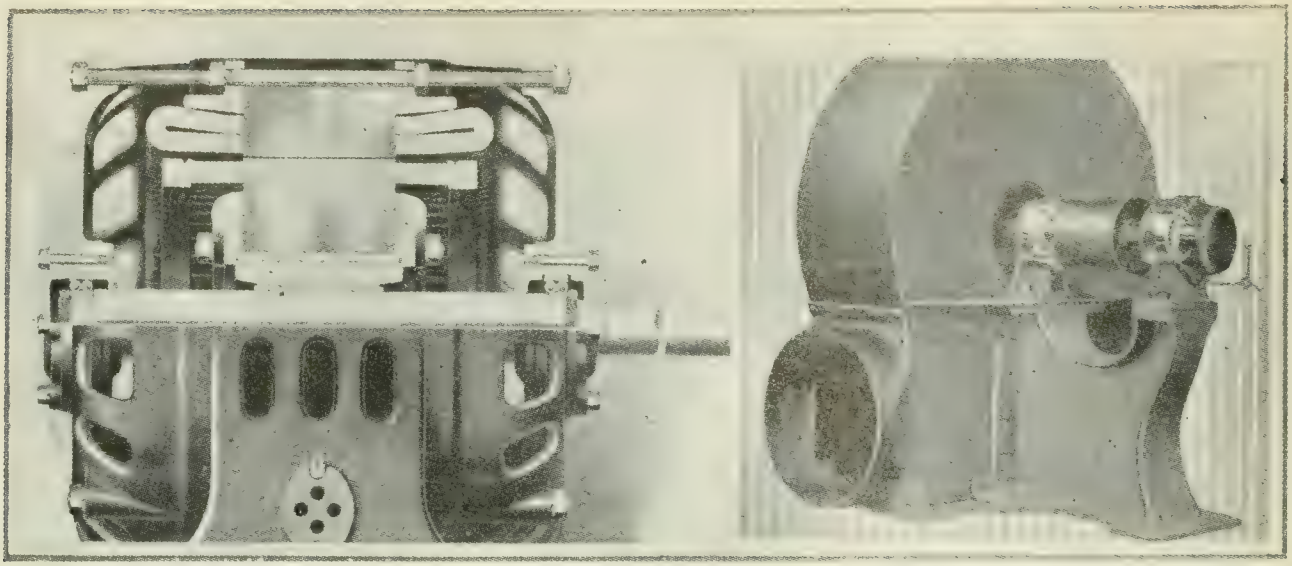


FIG. 16—MOTOR EQUIPPED WITH BALL BEARINGS.

FIG. 17—A GOOD EXAMPLE OF A FAN SPINDLE EQUIPPED WITH BALL BEARINGS.

in the upper or smaller collar B. See Fig. 11 in previous part of article.

For horizontal shafts, the collar B should be snug fit on the shaft, and the aligning washer should not have more than 0.01 inch clearance each side, so as to prevent the ball cage, spherically seated race and aligning washer from dropping when the load is released, thereby bringing up possibility of destructive pinching of balls when load is again applied.

Wherever shaft deflections are liable to occur, it is particularly necessary that a self-aligning type of bearing be used, and that the bearing be mounted as outlined above.

Typical Ball Bearing Applications

While twenty years ago ball bearings were generally known only in bicycles, today they are used in almost every industry. Indeed many machines, or developments in machines, owe their very existence to the modern ball bearings, some excellent examples of this being the Dumore precision grinder, the eleven thousand r.p.m. wood-working shaper, the Sperry gyroscopic compass and the Sperry gyroscopic stabilizer for aeroplanes. The rotor runs at 8,600 r.p.m on the Sperry compass, and at 14,000 r.p.m. on the stabilizer.

As the field of ballbearing applications is now so broad and the number of proven successes so great, it is impossible to give even a summary of them in an article of this nature. It will be sufficient, therefore, to select a few examples at random, not because they possess greater merit than others, but because they happen to come first to mind.

Nearly all types of electric motors have been ball bearing equipped, and in no case have they failed to show a distinct advantage over the old plain bearings. An analysis of the records of such motors shows that fewer repairs are required, longer periods can be allowed between motor inspections, and the whole cost of maintenance is considerably decreased. The extent to which this applies in car lighting generators is clearly shown in the following testimony of a superintendent of inspection of one of the largest railroads in the United States. He claims that due to ball bearings, the cost of generator maintenance has been reduced on coaches 66 per cent. and on diners 46 per cent. He has never had a hot bearing, never lost a field or armature, the inside of the generator is dry, and he has had no trouble due to grounds or short circuits. Truly this is a remarkable record when it is remembered the severe conditions under which a car lighting generator is called upon to operate—exposed to snow and ice, heat, dirt and water, and the jolts and shocks of passing cross-overs and switches.

Owing to the precision of a ball bearing and its freedom from wear, the bearing adjustment remains constant and the rotor is kept in the centre of the magnetic field. This permits the motor manufacturer to employ air gaps with clear-

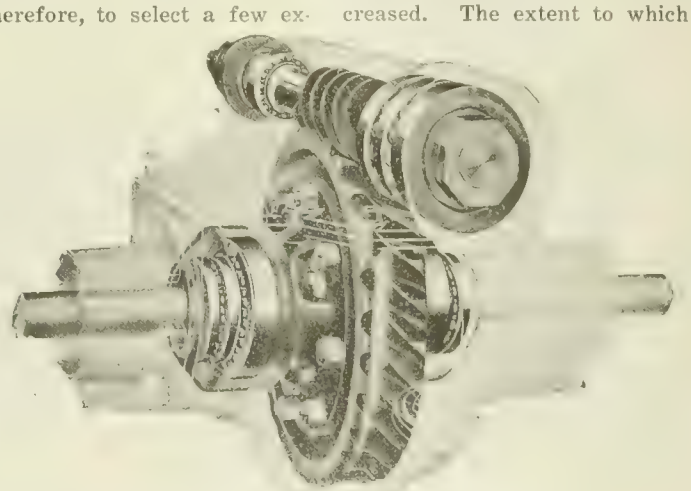


FIG. 18—WORM DRIVE EQUIPPED WITH BALL BEARINGS.

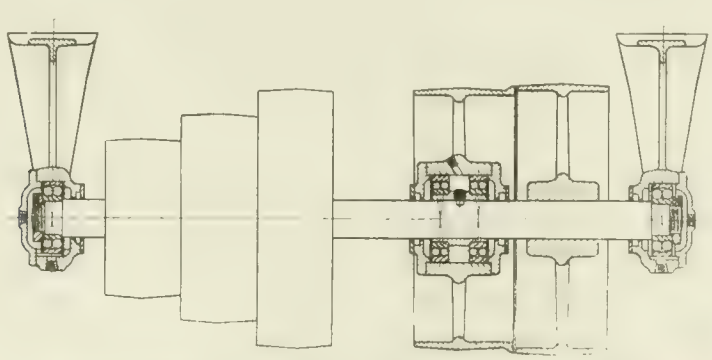


FIG. 20—TYPICAL EXAMPLE OF BALL BEARING HANGER.

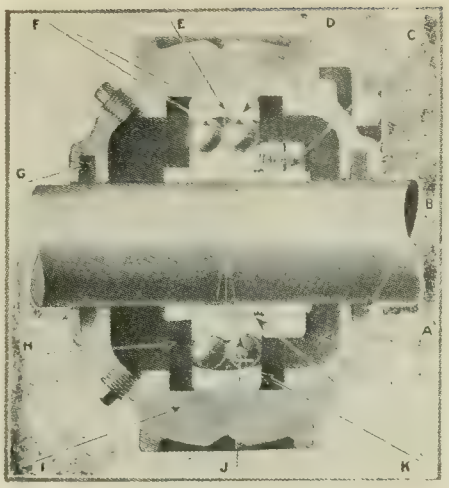


FIG. 21—CONSTRUCTION DETAILS OF BEARING CASING.

ances so slight that they could not be considered on motors having any other type of bearing. On induction motors a close air gap is of vital importance in the improvement of the power factor and the machine efficiency. A ball bearing equipped motor is shown in Fig. 16.

Fans or blowers, such as that shown in Fig. 17, provide an excellent example of what ball bearings will do in the way of improving the equipment of the average plant. Owing to the high speed at which they are driven they are a constant source of trouble and expense, but, as has been proven for years now, ball bearings not only reduce the friction load but eliminate all bearing trouble as well. The change is usually a simple one to make, it being necessary only to bolt a ball bearing pillow block on the frame from which the plain bearing has been removed.

With regard to the automobile, little need be said as its present success is made possible by the anti-friction bearing. Fig. 18 illustrates a worm drive on ball bearings.

Fig. 20 depicts a countershaft equipped with ball bearings. All necessary information can be secured from this view, so let us pass on to Fig. 21, which gives the constructional details of the bearing casing used in the installation shown at Fig. 20.

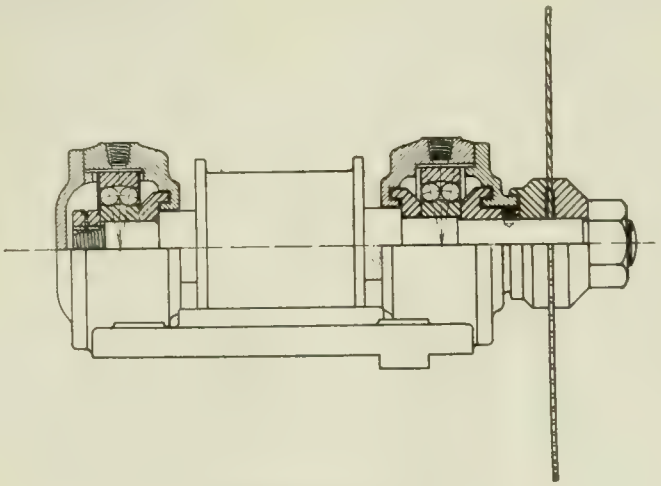
The points to be noted are the large lubricant chambers at A (sufficient for several months' running) and the method of rendering the housing oil-tight and dust proof by using a sealing groove containing a stiff felt washer as shown at B. This washer presses on the shaft and effectively closes the opening. It should be remembered that there is enough give in the washer to allow for any deflections of the shaft in the self-aligning bearing, and that the casing is thus kept oil tight under all conditions of shaft deflection that will be met with in practice.

The split sleeve and locking nut is shown at C, while D illustrates the self-aligning feature. E illustrates the outer race, while F depicts the principle of the two rows of balls, viz., the least load per ball. G illustrates the other sealing groove, while H shows how the bearing is open at both sides, permitting a positive circulation of lubricant. I denotes the bearing casing, while J illustrates the one-piece ball cage. The last letter K depicts both the outer and inner race.

The construction of the loose pulleys mentioned is clearly shown in the line drawing, Fig. 22. Two radial bearings are mounted on a steel sleeve, which is held to the shaft by a set collar and used to locate the pulley in position. The design is simple and provides a large lubricant chamber between the bearings, sufficient to hold enough grease for six months' running. The end caps keep out the dirt and prevent the escape of lubricant. The pulley is strong, well balanced, and will carry any belt at any speed without running hot.

An application of interest to all woodworking plants is the circular saw arbor shown in Fig. 23. The high speed and heavy load impose a severe duty on the bearings, but these conditions are easily taken care of by ball bearings, if the bearings are properly protected. The distinctive feature of this design is the labyrinth type of packing used to prevent the leakage of oil and the intrusion of dirt. The rings fit against shoulders on the shaft and are let into the housing. The inner race of the left hand bearing is locked against the ring by means of a nut and covered in by an end cap. In the right hand housing a ring is pressed against the inner race of the bearing, the ring being held in position by a set screw.

Another application to woodworking machinery, which has been revolutionary in nature, is that of ball bearings to the spindles of high speed shapers. By this means, shapers have been developed until now they can be run successfully at 11,000 r.p.m. High speed ball bearing shapers will turn out about twice the work of a plain bearing shaper and do it better. Very often the work is of such fine quality no sanding is required. This is important because sanding means considerable expense, and in connection with



CIRCULAR SAW ARBOR MOUNTED ON BALL BEARINGS.

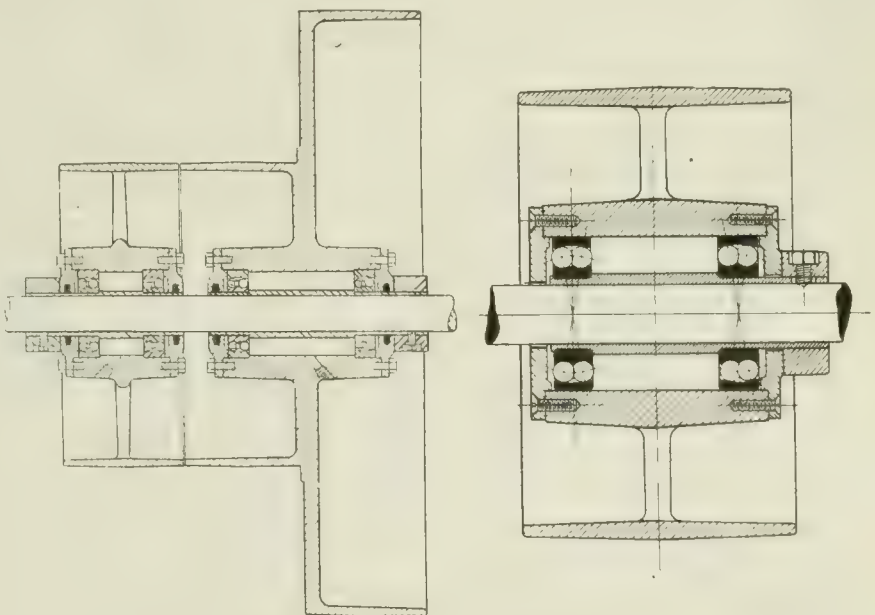


FIG. 22—TYPICAL INSTALLATION OF BALL BEARINGS TO LOOSE PULLEYS.

shaper work it often amounts to twice the cost of the work itself. As will be seen from Fig. 24, the mounting is very simple, the spindle being steadied by means of two radial bearings—one above the pulley and one below. The weight of the spindle or thrust is taken on a ball at the lower end of the spindle. Great care must be exercised to see that the spindle and pulley are accurately balanced, as, otherwise, at the high speed employed, the vibration will become excessive.

Grinder Installations

Figs. 25 and 26 illustrate two types of mountings for precision grinders where elimination of chatter is a necessity. The first illustration shows a high speed precision grinder spindle with a take up feature which eliminates any possibility of chatter; two radial bearings on the wheel end of the spindle being pressed against each other on the outer raceways. This mounting is suitable for high speed grinding where endless belts are used. It is necessary in this case, that there be no joint in the belt, as this would cause shock to the spindle.

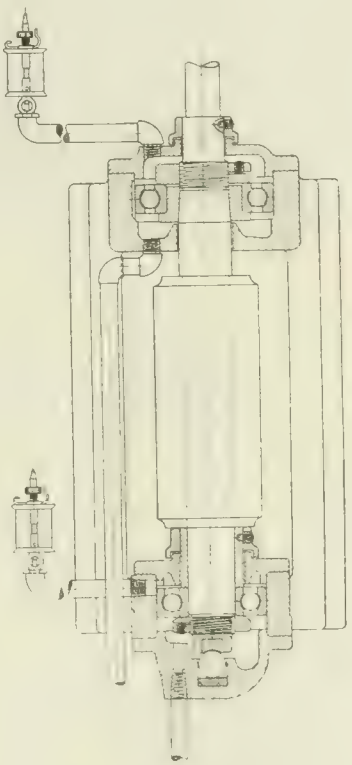
The second illustration is an application for a large precision grinder spindle; two bearings on the wheel end being adjustable against each other on the outer raceways to eliminate chatter. The bearing on the other end has to carry only the weight of the spindle. The driving pulley is carried separately by two radial bearings and the spindle is driven from it by slots or grooves in the shaft. The reason for mounting the pulley separately from the shaft is so that any shock from the belt joint cannot be transferred to the spindle. Both of these grinder designs are covered by patents.

Another illustration of ball bearing application to machine shop equipment is shown in Fig. 27, which is an excellent example of a ball bearing lathe head. The drawing which is a cross section through the headstock of a single purpose lathe, shows the method of mounting the ball bearings. The large radial bearing is locked against a shoulder on the spindle by means of a nut, thus holding it in position. The housing for this bearing has two felt washers on the outer end, and one on the inner end to prevent chips and dirt from getting into the bearing, and the lubricant from getting out. The cone pulleys are carried on two radial bearings held in position by means of a short and long sleeve and a locknut. The housing at the right hand of the headstock contains a radial bearing for carrying the spindle and a thrust bearing for taking the entire end thrust on the spindle. It will be noted that the radial bearing is locked against a shoulder on the spindle by a nut. One ring of the thrust bearing is mounted against a shoulder on the spindle, while the other, which has a spherical seat and is self-aligning, engages with a steel washer let into the end cap. The back gears are also carried on radial ball bearings.

These examples could be extended indefinitely, but space forbids. It may be stated generally, however, that wherever high speed is encountered or reliability is essential or power saving is a consideration, ball bearings should be adopted.

Lubrication of Ball Bearings

Oils as well as greases may be used as lubricants for ball bearings. If oil be used, the housing of the bearing should



WOOD SHAPER SPINDLE EQUIPPED WITH BALL BEARINGS.

be filled up to about the centre of the lowest ball. If grease be used, the housing should be filled about one-half to three-quarters. On account of the fact that lubricants, particularly greases, which are sold under trade names, show great variations in composition and quality, it is advisable that lubricants for ball bearings be purchased according to specifications and not according to trade names only. Below are given a number of such specifications, which are designated A, B, C, etc.

"A"—Very Light Ball Bearing Oil

	Maximum
Free Acid	.10%
Free Alkali	.10%
Sulphur	.03%
	Maximum
Ash	Trace
Resin	None
Salt	None

Heat Test (15 min. at Flash Point) Darkening, but no sediment slight.

Oil should be pure, mineral and have no tendency to gum or become sticky.

	Minimum
Flash Point (Cleveland Open Cup)	300°F.
Fire Test	350°F.

Viscosity (Saybolt from 50 to 100 secs. at 100° F.

"B" Light Ball Bearing Oil. Same as "A" except Viscosity (Saybolt) from 100 to 200 secs.

"C"—Medium Ball Bearing Oil. Same as "A" except Viscosity from 200 to 300 secs.

"D"—Heavy Ball Bearing Oil. Same as "A" except Viscosity from 300 to 500 secs.

"E"—Extra Heavy Ball Bearing Oil. Viscosity from 500 secs. or above.

"F"—Same as "B" except that in addition Pour Test —5°F.

"G"—Grease

	Maximum
Free Acid (calculated as oleic acid)	.10%
Free Alkali (calculated as sodium hydroxide)	.10%
Free Lime (calculated as Calc. Oxide)	.10%
Sulphur	.03%
Resin	None
Salt	None
Neutral Saponifiable Oil	1.00%
Abrasive particles (sand, etc.)	None
Melting Point, about	180°F

Grease should have no tendency to gum or become sticky. It should not contain graphite or fillers of any kind.

Selection of Lubricants

As a general guide, the following considerations may be useful:

1. For very high speed, say over 3,000 r.p.m., use a light oil, such as "A" or "B." If the surrounding temperature exceeds 150 degrees Fah., oil "C" may be used.

2. For speeds from 600 to 3,000 r.p.m., use oil "B" or "C." If the surrounding temperature exceeds 150 degrees Fah., oil "D" may be used.

3. For speeds from 100 to 600 r.p.m., use oil "C" or grease "G," or if surrounding temperature exceeds 150 degrees Fah., oil "D."

4. For speeds below 100 r.p.m., use oil "D" or grease "G," or if surrounding temperature exceeds 150 degrees Fah., oil "E."

5. For temperatures below 32 degrees Fah., use oil "F."

Grease should be used when, on account of local conditions, it is difficult to keep oil in the bearing. It is not generally recommended where the speed exceeds, say 600 r.p.m., or where the surrounding temperature may attain 140 degrees Fah. or above. The consistency of the grease to be used depends on the conditions of operation. The necessary con-

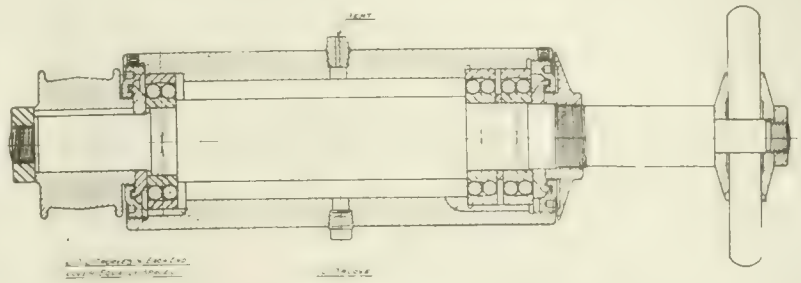


FIG. 25. BALL BEARINGS AS USED ON PRECISION GRINDER SPINDLE.

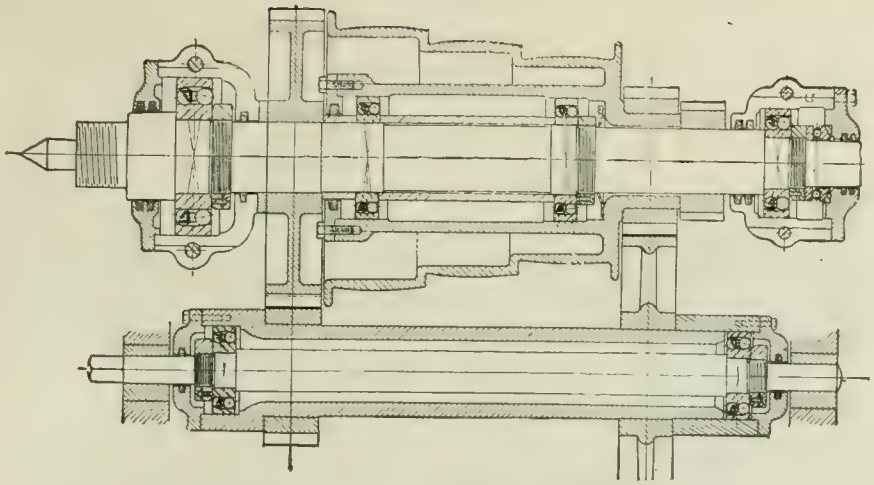


FIG. 27—EXAMPLE OF BALL BEARING LATHE HEAD.

sistencies in numerical values cannot be specified until a satisfactory testing method has been agreed upon by the trade.

The above speeds refer to bearings of an average size of 2-inch bore. If the actual size is greatly different, the speed of the bearing should be divided by two and multiplied by the actual shaft diameter. The speed so obtained should be used as a basis for selection of a lubricant.

Application of Lubricants

The renewal of the lubricant in a ball bearing depends to a great extent upon the operating conditions of the machinery. In the ordinary type of installation, operating under normal conditions, renewal should be made about three times a year, although close observation for a short time after installation will enable a better estimate to be made of the proper period of time.

When feasible, in cleaning the bearings, the old oil should be removed, the drain plugs then inserted and the housing filled with kerosene. The drain plugs should then be removed and the housing carefully drained.

The drain plugs should again be inserted and the housing filled with a small supply of the proper oil. The bearings should then be rotated for a few moments and then drained in order to be certain that the last traces of kerosene have been removed. After this second operation, the housing should be filled with the correct grade of oil to the proper level, and the bearing is ready for operation.

Care should be exercised to avoid putting too much grease into the housing, as this will result in its being forced out through the packing. In cleaning a bearing lubricated with grease, it is advisable to wash the parts thoroughly first in kerosene, and then with some good light bodied oil. The bearing may then be reassembled and packed with grease. In case the bearing contains a residue of soap that cannot be removed with kerosene alone, it is advisable to use a hot mixture (not over 150 degrees Fah.) of kerosene and denatured alcohol.

The Lakewood Engineering Company, Cleveland, Ohio, announce the appointment of Kelley Powell, Ltd., 403 McArthur Building, Winnipeg, Canada, as agents for the Provinces of Manitoba, Saskatchewan, Alberta and Western Ontario, for the sale of Lakewood paving, construction, and industrial equipment.

A SAVING OF 50 PER CENT.

A rather interesting use for the photostat has recently come to our attention. H. B. Freeman, managing art director of Vogue, states as follows:

"Before adopting the photostat, layout work in our art department was done by the system of diagonals, and measurements commonly used to layout a page containing photographs and drawings according to specifications. This consumed time, and four days, often more, was required to get complete page material into the printer's hands. With the photostat we accomplish the same work in two days.

"For example: the page has four photographs and two drawings, and it requires titles and captions for every subject. The photostat makes a negative of each subject. Then positives in sizes governed by the initial rough layout. These subjects are then assembled, pasted on a dummy sheet, and arranged to best advantage. Titles and captions are marked in proper positions. The page is then complete.

"Next, a positive is made from a negative of the entire page. This goes to the engraver and serves as a guide as to position, crop marks, and sizes of copy. The original dummy goes to the editorial department for captions and titles. The dummy then goes to the printer's, where the titles and captions are set in type and positioned to receive the cuts when they arrive. Thus, every operation is independent of the others. That is why the time previously required has been reduced 50 per cent.

"Any changes can now be made at the small cost of another paper print. Remaking an engraved plate at a much larger expense was previously necessary. From this one example you can see how expensive several re-orders each issue would be. A year's total would give a rather large figure—a good reason for serious consideration of the practical value of this method."

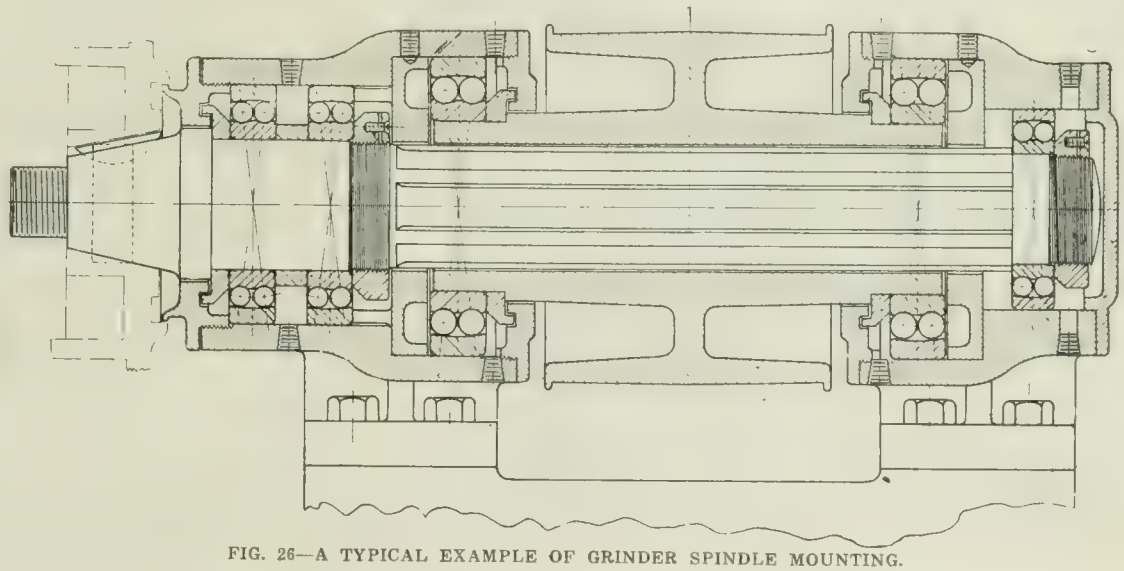


FIG. 26—A TYPICAL EXAMPLE OF GRINDER SPINDLE MOUNTING.

Apprentices Should Learn Trade Thoroughly

By PETER MASTERSON, Foreman of Tool Department, International Harvester Co., Ltd., Hamilton

"I BELIEVE in being a pal—rather than a foreman to my apprentices." This, in a nutshell, is why Peter Masterson, foreman of the tool department at the International Harvester Company, Hamilton, Ontario, has made such a success of his position. He has held down his job for the past fourteen years, and is known, not as Mr. Masterson, but simply as "Pete." He is always open for suggestions, in fact is mighty glad to get them, with the result that he is a pal with his men as well as with his apprentices. No one takes advantage of his friendliness, and his orders are obeyed to the letter, not through fear of discharge, but because the men take an actual delight in pleasing him.

"What's your opinion of the possibilities in the machinist trade at the present time?" asked Canadian Machinery, "and how, in your opinion, should an apprentice be trained, that is, to make a real mechanic of him at the finish?"

"That's a large sized order you've handed me," countered Pete with a smile, "but I'll answer it to the best of my ability. First let me speak of the possibilities in the trade at the present time. To my mind they were never better. The young man of today has a wonderful chance. He has the privilege of working with the most up-to-date machine tools; he is given better and finer work than the old timers ever received, and what's more he is given better instruction than was possible in the old days.

"If you will pardon the personal reference, here is what I mean. When I was an apprentice my life was no bed of roses. I was continually bickering, for as soon as you proved adept at some particular machine, there they wanted to hold you. I remember on one occasion I had to walk for my coat and hat before I gained my point. I had just succeeded in being transferred from the lathe to the assembling department, but my success was apparently going to be short lived, for along came the superintendent a few days afterward with the order that I was to go back to my old job on the lathe.

"'Why do I have to go back?' I queried.

"'Because you're told to,' came the reply, 'and what is more, you're the only one familiar with the job we want.'

"It was a show down pure and simple, and I realized it.

"'All right,' I said, 'I guess I'm through. If you won't give me a chance to learn the different angles of the business, I guess I'd better get out and learn it some other place.'

"You can imagine the look on the superintendent's face, and off I walked for my coat and hat. There is no need of going into the details. Enough to say I won my point, and stayed in the assembly department, but I merely tell the story as one incident in my rather checkered career.

"I was anxious to get on—in fact was determined to get on, no matter what the cost. The necessity of thus asserting yourself, however, is over. The apprentice of today, except perhaps in a few isolated cases, gets a real chance to learn the business from one end to the other."

"How were wages in those days?"

"Wages!" laughed Pete. "Well, the least said about them the better. Even the full fledged journeyman made only $1.80 per day, so guess for yourself how many cents I made per week.

Technical Chances

"Then look at the technical chances at the present time. Take the first class technical schools. The apprentice can go to such schools as many nights a week as he cares to—and all free, or at least practically so. If he attends all the classes he gets his fees returned. The very best of instructors impart information that will stand him in good stead, and at the same time increase his earning power."

"Then you thoroughly believe in such schools?"

"Most assuredly," came back the answer. "The man or boy who doesn't believe in them has something wrong internally. You know, our boys here are sent up to the technical school half a day each week. The firm pays their regular wages, and even though they do this, it's funny how some will try to skip instruction, or in plain words, play hookey. Of course such boys are the exception—and we soon find them out. In fact, each apprentice must sign his name on a sheet as he enters the school, and the time of his entering and leaving are noted on the same sheet. I receive these reports at the office, and of course have an actual tab on every boy.

"I remember one particular case of a lad who looked as if he had the goods, but who would persist in playing hookey. I hated to let him out, for his father who worked for me was a real mechanic, and I felt the son had it in him too if he would only settle down to school. His work at the plant was splendid, so I decided to have a chat with his father about it. When I told him that his son had been skipping instruction he went higher than a kite and promised to wipe the floor with him. In fact, I had some trouble in holding back the exhibition right in the department, but finally I persuaded him that such a procedure would only make matters worse.

"After some further discussion I decided to try diplomacy. I got this prodigal aside and in a quiet way talked the matter over. I put it straight up to him that if he wanted to be a success he would have to do some home study, attend the technical school, and learn mechanical drawing and mathematics. Soon he began to see my angle of it and admitted that there might be something to this study stuff after all. Having gained my point, I did not follow it up by a lecture, but told him how glad I was he had seen it my way and we parted the best of friends. Today that boy is as good a worker as I have, and before you leave I'll let you have a chat with him, so that you can form your own judgment."

"His work at the school—how is that coming along?"

"Fine,—in fact I'm glad you raised that point, for I've got a hobby, if you might call it so, in watching the char-

PETER MASTERSON

TO tell the complete story of Pete's career would read like a dime novel. Enough to say he started in the usual way by becoming an apprentice, but refused to follow the work at the usual pace, with the result that he was making tradesman's wages long before his time was out.

By persistent plugging he has now reached a position where he can guide the career of others, and is doing so to the best of his ability. Let any young fellow show Pete signs of ambition, then watch him bring it out. The boys like him, and he likes the boys. This, briefly, is why he is a success, and a real pal to men and boys alike.

WORK THAT WAS OVERDONE

Here is a story that Mr. Masterson swears is true, and should serve both as a story and an object lesson.

"I remember a funny experience that happened to an apprentice—one of the type who would persist in roaming all over the shop while his machine was feeding. On this particular day he set his boring tool in position to bore out a rather long hole, slipped in the feed, then went a-visiting—but—he roamed too long.

"Imagine his surprise to find on his return that the tool had done its work well—in fact, too good, for it had not only bored out the hole, but the chuck and lathe spindle as well, the result being that the chuck, work and part of the lathe spindle rested gracefully (?) over the boring tool, while the machine was still feeding right merrily.

"Luckily, this apprentice had vision enough to imagine what was going to happen him, so without giving the foreman the trouble of discharging him, he secured his coat and hat, left the plant, and has never been heard from since."

acter of each boy from his drawings that are completed at the school. The character of each individual stands right out of the drawing. If the boy is careless by nature his drawings are smudgy, sort of semi-finished, and lack the touch of the neat, painstaking worker who must have everything perfect before he calls it a day.

"To show you that we give the boys every chance to succeed, let me tell you two rather interesting stories. Some time ago the foreman of our bolt department said to me, 'Say, Pete, the first time you have an opening for an apprentice let me know. I have a young fellow in my department who is too good to stay there.'

"On the first opening occurring, I went down, had a talk with this young chap, and although he was doubtful about making the change, I signed him up. This fellow had no special education to speak of, yet by home and school study, plus the instruction he received from us, he developed into a splendid mechanic. He had it in him. We merely helped to bring it out.

Taking a Chance

"In telling the next story, I'm sort of taking a chance, for some foremen may not agree with me. However, in my own mind I am fully convinced that my viewpoint is correct, so here goes the story.

"Some time ago I had a young apprentice working for me that showed great promise of success. He was always eager to learn, and I often invited him up to my house when we would continue his lessons in the quiet atmosphere of the home.

"Of course, neither he nor I discussed these meetings in the shop, for had we done so, I feel sure the rest of the boys would have thought he was a sponger. The real cause of his friendliness was his desire to learn more, and never once did he presume on that friendship. I tell this story because I want some young fellows to read it—then lose this idea of sponging. Go to your foreman, ask his advice and if he is the right kind, he will give you all the help he can, without ever considering you are sponging, or presuming in any way. Of course there are a few foremen, a very few, who would resent an apprentice bothering (?) them, but luckily the variety are dying out. The day of the driver is gone. I never bawl a man out in public. He resents it, and it doesn't do any good. Get a man to one side, tell him frankly if you have a grievance against him, and you've made still another friend, contradictory as it may seem.

"Then there is the question of technical literature. To my mind this is a very important aid to success. More reading of such magazines as the one you represent would aid apprentices, machinists and tool makers alike to keep up to date. I wish I could hit this point home to every mechanic, especially the apprentice, who is really the mechanic of the future."

Mr. Masterson is of the belief that specialization can be carried to extremes. As he so aptly put it, "The amount of specialization depends entirely on the nature of the work being produced." An apprentice should learn how to operate different machine tools, also fitting work, but if a journeyman decides to become a specialist on some particular machine—well, that is his own business. As long as specialization is looked at from the viewpoint of production it will continue irrespective of our opinions.

"In one plant that I know of, this spe-

RIGHT FROM THE SHOULDER

"As I have told you already, I believe the day of the driver is gone," said Mr. Masterson. "But here is a rather humorous tale to show that even a bulldozing foreman can have a saving grace of humor.

"This particular foreman was about the worst grouch I ever met, and was continually nagging and threatening his men. They lived in terror of his ways, and used to warn each newcomer what to expect. One day, however, in came a chap who was extremely anxious to please the boss—and on being told by one of the men to watch out for old grouch, etc., he promptly went and told the foreman what had been said about him.

"It looked bad for the workman who had meant well in warning the tyro, and soon the three interested, namely, the foreman, new man, and informant, were all assembled in the one room.

"'Did you tell this guy I was no good, a bulldozer, a grouch, etc.?' thundered the foreman."

"The poor worker had visions of losing his job, and jobs were none too plentiful at that time, but he decided to brave it out. 'I did,' he replied, 'and what's more, you're all I said you were.'

"The foreman growled in his throat, then said: 'Well, be that as it may—let him find the —— thing out for himself. Go back to work.' And he did, but strange to relate, the foreman was never so grouchy as he had been before to that particular chap."

WHY COMMENT ON THIS PICTURE? IT SPEAKS FOR ITSELF. PETE STANDS IN THE CENTRE, WHILE THE FOUR HUSKIES IN VARIED ATTITUDES ARE THE APPRENTICES WHO WERE PRESENT WHEN THE WRITER CALLED.

cializing is carried to the extreme. A considerable number of die sinkers are employed; in fact the majority of their help is of this branch of the trade. Suppose a new man applies for a position, claims he is a die sinker, and is told to come into work in the morning. On arrival he is placed in a corner by himself, not with the regular workers, and there he must work out his destiny, namely, prove his worth without help of any kind. Providing he makes good, both as to quality and speed, he is moved beside the other men. Should he be of only average value he is gently but firmly shown the door. This, to my mind, is specialization carried to the point of being ridiculous.

"A new man entering our employ is not handed the hardest job first, but is given a chance to find himself. Some men are naturally nervous at the start and do not display their best work until accustomed to the surroundings. It is my contention that if you give a man a chance he will do better work in the end. In other words, have confidence in the men, and they in turn will have confidence in you. But let me stop at this point and take you out to see a few of the lads who are serving their apprenticeship. There are only four here today, as we split things up to let some go to school, others to stay and work, this preventing any severe change in our department, as far as the operation of the machines is concerned."

The Boy's Viewpoint

The first one spoken to was a fellow called Turner.

"What do you think of the school idea?" we asked; and back came the answer, "Fine. I wouldn't be without the school training for anything. It has helped me wonderfully, and I can see the advantage of it clearly."

The second boy, McDougall, had a similar story to tell, and was especially thankful to the school for the help it had given him in fractions. "You know," he said, "I had forgotten all about fractions until I went back to school, and of course it is mighty handy, in fact necessary in my work."

"What studies do you cover?" we asked.

"Drawing and arithmetic of all kinds. In the drawing lessons we first of all make a sketch from some object, such as a casting for some machine. This is then taken away and we have to make a mechanical drawing from our sketch."

The other two chaps were of like mind, and one of these was the fellow who used to play hookey. He grinned sheepishly when we jollied him about it, but admitted he was now a strong booster. Decimals was his Jonah, until he went back to school, but now he has got them securely by the neck.

Every one of these boys, without any prompting, spoke of the value of the school in helping them read drawings. Each had his own way of putting it, but briefly here was the consensus of opinion —that they could now read a drawing quickly and intelligently, whereas before it looked Greek to them.

"You see," remarked Pete, on our returning to his office, "what I told you is absolutely true. Each of these boys is a booster and the others could tell the same story were they here. To my mind the profession is far from overcrowded and the benefits to be derived warrant a boy entering it. He should never be forced to enter it, merely because his father was a mechanic. He must first of all have a natural liking for it. As to the future, I believe it holds wonderful possibilities for the young fellow who really tries, and decides in his own mind to be a success."

STRAIGHTENING A ROTOR SHAFT

By D. A. HAMPSON

The method of straightening a rotor shaft described in the February 10 issue is both novel and instructive; it is one that should suggest a way out of other ticklish straightening jobs. There is no question but that there are unrelieved stresses in a shaft so repaired—if there is a suitable factor of strength in the original shaft and if the service is not fatiguing, no harm will result. The conditions under which a repair is performed often make it necessary to violate the teachings of theory, but if results are the true test of engineering, then such repairs must constitute good practice.

Some time ago a screw was brought into our place to be straightened. It was a piece of steel twenty feet long over all with fifteen feet of square thread, single, having a pitch of one inch and an O.D. of three. This screw was part of a special machine and moved a heavy carriage back and forth. Something had blocked the carriage and the screw, making 200 R.P.M., had bent close up to the nut. It was a job we did not want to do for obvious reasons, and we frankly told the customer so, but he did not want to send it away to the people who made the machines and he agreed to pay well for the time and accept all risk.

There was no lathe within forty miles that would take the length or over half of it, but we had a planer with a fifteen foot table, and by placing the screw diagonally (to dodge the slots), we were able to roll it on the top for sighting purposes. It was not hard to pick out the bend—a straight-edge would do that —but it is always of great assistance to rotate a piece being straightened.

Actual straightening was done by putting the bend down, with a block under this part to raise it half an inch from the table, and then drawing down on clamps on each side of the spot. The planer was a heavy one and we had no fear as to which piece would go first. Our fear was that we would get too far, and, worse, would get a reverse bend alongside the original one. To be safe, we bored out a piece of cast iron to three inches, and sawed it up into three pieces, putting a short section under the screw and longer ones under the clamps.

A swaging tool was also forged out and fitted to the space and curve between the threads. This was used to force back the metal where it had been compressed, thus assisting the clamps as pulled down, and putting a stress of compression in the metal where there would otherwise have been only the tension due to drawing the screw back to a straight line. As the clamps were pulled down, this swaging, or peening, was carried on—greatest at the point of bend and tapering off in amount for a couple of threads each side.

After a cautious trial of this scheme, followed by more confident repetitions, we pronounced the screw commercially straight. Indeed, it was a first-class job and surprised us ourselves. There was a certain amount of stretch at the critical point, that we knew, but as it was not discernible with a rule and showed up only when calipers were applied, we thought there would be no interference in passing through the nut—and luckily there was none.

Editor's Note: This is the style of short articles we like. Snappy and to the point—yet imparting information of real value to the mechanic. Let us hear from others, not only on the subject of straightening, but about any unusual repairs.

LACQUERING METALS

Occasionally tin and other white metals are required for decorative purposes, remarks Practical Engineer. Should a yellow be desirable, plus some degree of brightness, the following lacquers will prove very useful. Steep 2 oz. of turmeric (coarsely ground) and ½ oz. of gamboge in two pints of clear methylated spirit for about ten days and then add 2 oz. of pale shellac. When the shellac is dissolved strain it through fine muslin and use. Or take mastic in tears 1 oz., gum sundarac 1 oz., gum elerni ½ oz., gum animé ½ oz., and dissolve in one pint of clear spirit, and add gamboge, or soluble extract of saffron, or annatto previously dissolved in spirit, the amount depending on the color required. The articles to which the lacquer is applied must be quite clean and free from grease, and the coating should be applied in a warm apartment free from floating dust.

New Branch.—It has been announced by the W. S. Mahaffy Company, Gladstone and Trafalgar Avenues, Toronto, that they are operating a new department known as the Ornamental Iron Products Company. H. Harlander, former superintendent of the Canada Foundry Company, and for twelve years with the firm of John Williams, Inc., New York, is in charge of production.

The First True Diesel Made In Canada

The History of the Diesel Engine—Two-Cycle, Four-Cycle, Solid Injection and Atomised Injection—General Description of the D. S. P. 100 B. H. P. 4-Cylinder Diesel

THOSE people who were interested in the exhibits shown in the Machinery Hall at the Toronto Exposition last year doubtless all stopped for a more or less interested look at a new kind of engine. This was the 125 h.p. Diesel exhibited by the Dominion Steel Products Co. of Brantford, and the first of its kind to be built in Canada. It is of the full or true Diesel type, as distinguished from the hot bulb or other surface ignition engines. This type of engine will doubtless have a great part in the developing of some of the outlying parts of our country, and every engineer should understand its principles and operating features.

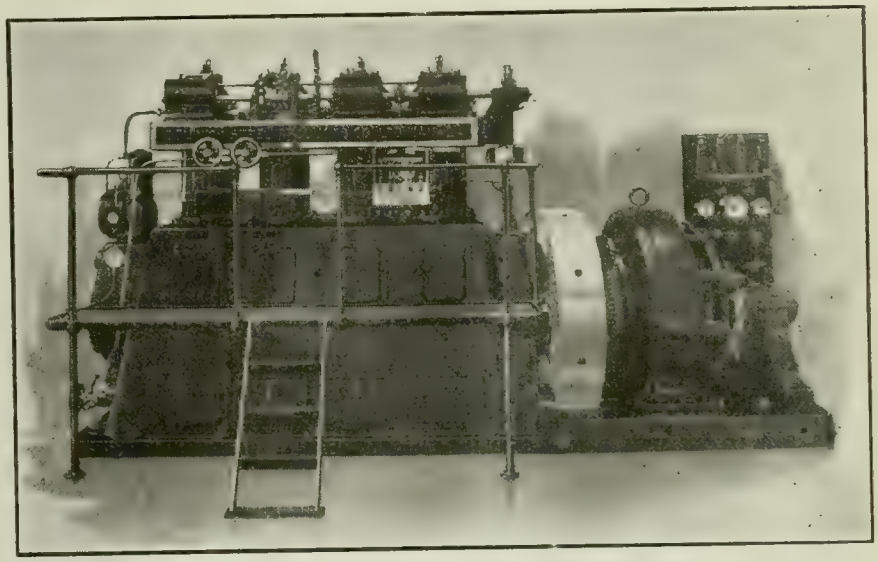
The History of the Diesel

The Diesel engine should really be known as the Ackroyd Priestman engine, as the cycle it works on was first mooted by these two engineers in England, some years before Dr. Diesel took up the study of this principle. However, Dr. Diesel is usually conceded to be the man who first actually demonstrated its possibilities, and the basic patents were taken out by him in 1892. He built his first engine in 1893, and this was driven by a belt and did not do any work. What it did do, however, was to prove that oil could be ignited by the heat of compression of air, which is the main feature of the true Diesel engine. In the experimental engine, Dr. Diesel obtained a pressure of 1,350 pounds per square inch, and incidentally when the fuel was injected, the explosion that followed wrecked the engine. It almost resulted in the death of the inventor, but he rose from the ruins triumphant, for, even if the engine was demolished, the principle was established that the fuel could be ignited by means of the heat of compression.

Another engine was built, this time the compression being kept down to 500 pounds per square inch, and on this occasion the full cycle was obtained. Later another engine was built, with the cylinder water cooled, in 1896. Dr. Diesel sold his patents in 1897 for the sum of $1,500,000, so unlike many inventors, he actually realized the reward of his endeavor. His life ended in a tragic manner, he being lost at sea while journeying from Antwerp to Harwich in the year 1913.

The Cycle of Operation

The Diesel engine is built in two principal types, the two and four stroke cycle. These types are divided again into other modified classifications. In general, the two stroke cycle gets an ignition at each revolution, and the four stroke cycle receives an impulse every second revolution. In the two cycle type, on the inward or upward stroke of the piston, the products of combustion are discharged, and a fresh charge of air drawn in and compressed. At the top of the stroke the fuel is injected, and the down stroke is the working stroke. In this type the scavenging, or getting rid of the exhaust gases, is a difficult problem, and various means are employed to effect it. The simplest, and most generally used, is crank case compression. The piston descending on the downward stroke, compresses the air in the crank case to five or ten pounds, and this air sweeps through ports on one side of the cylinder when uncovered by the piston, and drives the gases out through a set of ports on the opposite side of the cylinder. Enough air is received on top of the piston to give the necessary compression. In other types the scavenging is done by a separate pump. Then there is the opposed piston type, in which the compression takes place between two pistons in one cylinder, and the working stroke is obtained by one piston ascending and the other descending. These work on three cranks, two of them being at 180 degrees to the other. The top piston is supplied with a crosshead, from which two connecting rods are connected to the two cranks at the outside, while the bottom piston is attached to the centre crank. When explosion or ignition takes place, the top piston pulls the two outer cranks up, while the centre crank is pushed down by the bottom piston. This type is known as the Junker, pronounced Yunker. Very often the scavenging in this type is done by a separate air compressor, instead of using the crank case compression.



D.S.P. H.C. OIL ENGINE. FOR CENTRAL STATION SERVICE.

The four cycle type is divided into solid injection and air spray injection. In the solid injection type the fuel is injected by a fuel pump working at a pressure of 6,000 to 8,000 lbs., directly into the combustion chamber. In the air spray type, which is the one we are about to describe, the fuel is injected into a chamber containing compressed air at a pressure of about 1,000 lbs. per sq. inch, and shot into the combustion chamber as a finely atomized mixture of air and oil.

The two types have their different adherents, the solid injection school claiming that their method does away with the necessity of an air compressor steadily running, while the air spray school claim better combustion, which amply makes up for any supposed disadvantage from the use of a high-pressure air compressor.

The Four Cycle Type

In the four cycle type the first downward stroke, or outward stroke perhaps is a better way to put it, draws in a charge of pure air from the atmosphere, not the crank case. On the inward stroke this air is compressed to the required pressure, about 550 lbs., and at the top of the stroke the finely atomized fuel is injected by the air pressure from the air compressor delivery chamber. Ignition takes place at constant pressure, and the third stroke is the working stroke. On the fourth stroke the exhaust gases are discharged through a special exhaust valve and the cylinder is ready for the cycle to be repeated. The cycle may be described as suction, compression, expansion, and exhaust.

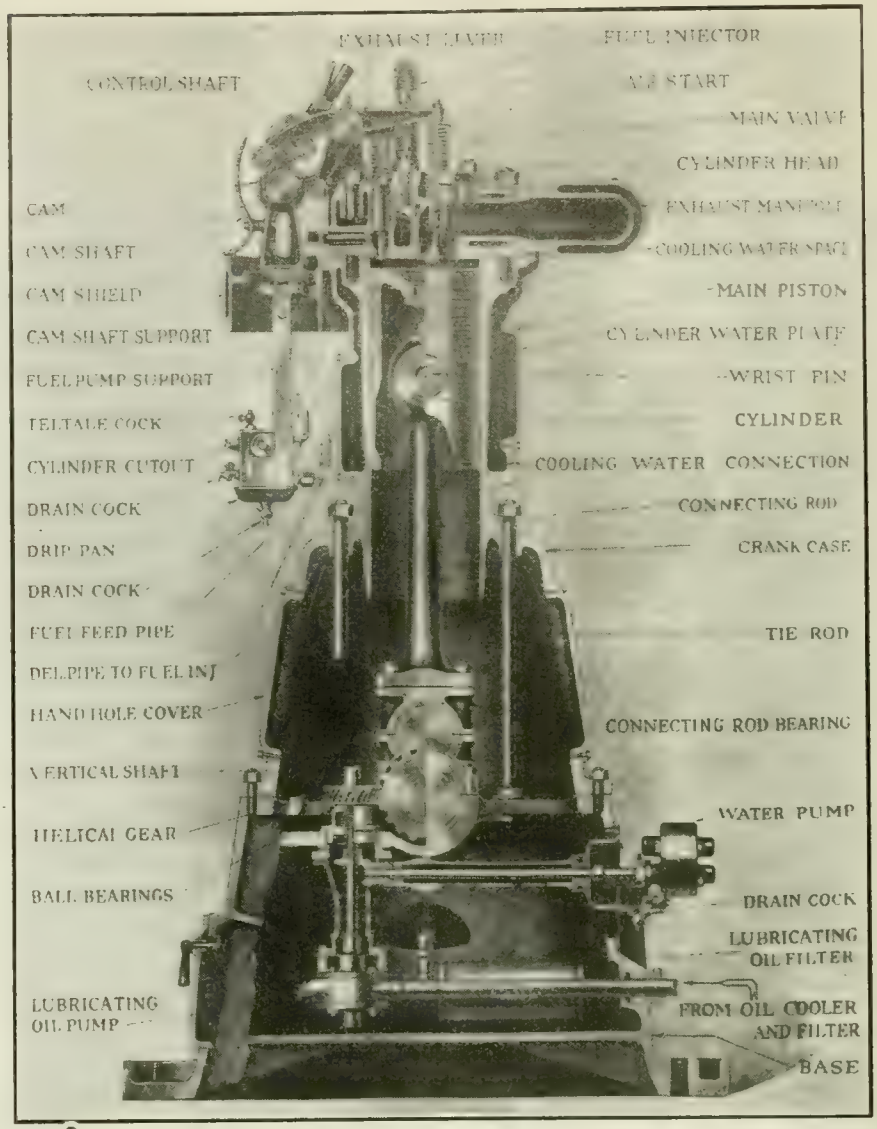
The D.S.P. Engine

The illustration herewith gives a good

idea of the outside appearance of the engine, directly connected to a generator, for power and lighting service. This is exactly as the engine appears in the shop where it is now engaged in running a number of machines and overhead cranes. The engine is four-cylinder, four cycle, spray injection. On the end opposite the flywheel and generator is the air compressor for injecting the fuel, and supplying the air bottles, which are used for starting purposes. On the front can be seen the fuel pump. Both of these pieces of apparatus will be described fully later on. The engine operates on crude oil, with a specific gravity of about .865, or even higher, but with this specific gravity the oil will flow without heating in to the fuel pump. The efficiency of the engine is high, as it will deliver practically 30 per cent. of the fuel energy at the pulley as useful work. This is, of course, much bigger than with any type of steam prime mover, and is attained in the Diesel engine because the fuel combustion takes place in the same chamber that the work is done in. With the steam engine, the combustion takes place in a furnace, the heat is conveyed through the plates of the boiler into the water, and then carried by the steam through piping into a cylinder or turbine casing, with many losses on the way due to radiation and friction.

In the engine we are dealing with compactness of design has been studied to good effect. It is necessary, of course, in an engine of this type to make provision for starting up. The method of starting is to admit compressed air to the cylinder to obtain the initial revolutions and compression. In order to do this it is necessary to have always a reserve of compressed air, and for this purpose bottles or flasks are provided, much like ammonia or oxygen cylinders. In most cases these are mounted on a wall convenient to the engine, but in the D.S.P. engine, provision has been made for carrying these bottles in the bedplate of the engine. This arrangement makes the engine absolutely self-contained, and ready to start the minute it is dropped down and secured to the foundation, and connection made to the fuel oil supply. The air is supplied to the bottles by the two stage air compressor situated on the end of the engine, and after the engine is started up this compressor supplies the air continually to the air injection valve for atomising the fuel. Such surplus air as may be delivered is diverted to the bottles.

The fuel pump is worked from a small crosshead, which is driven from a special eccentric mounted on the cam-shaft, which operates the valves. There are four plungers on this pump, one for each cylinder. The amount of fuel injected at each stroke is varied by a governor, which operates by holding the suction valve of the fuel pump open for a longer or shorter time, thus controlling the amount of fuel delivered per stroke.

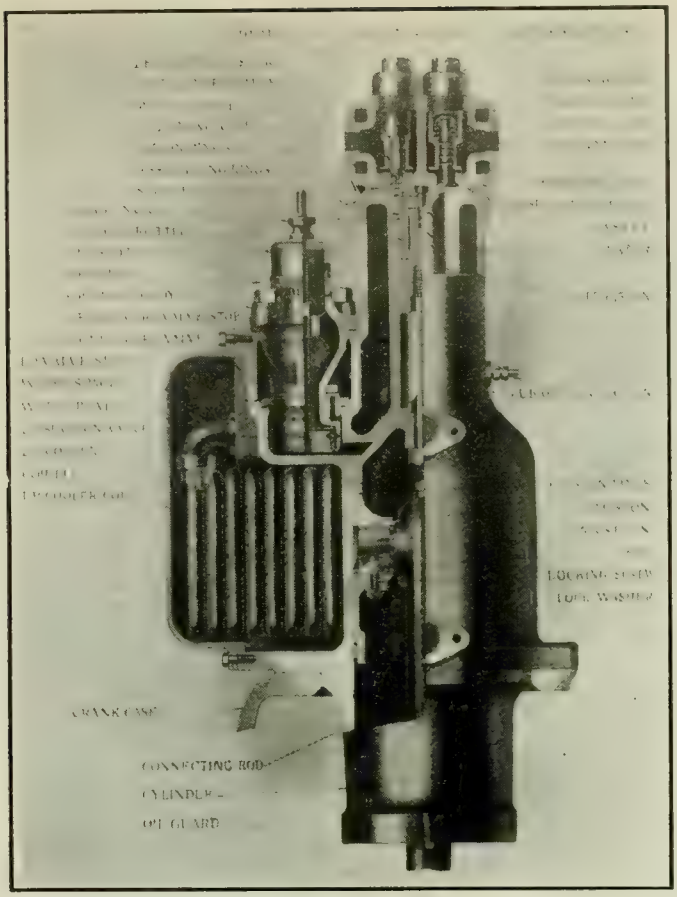


CROSS SECTION THROUGH CYLINDER.

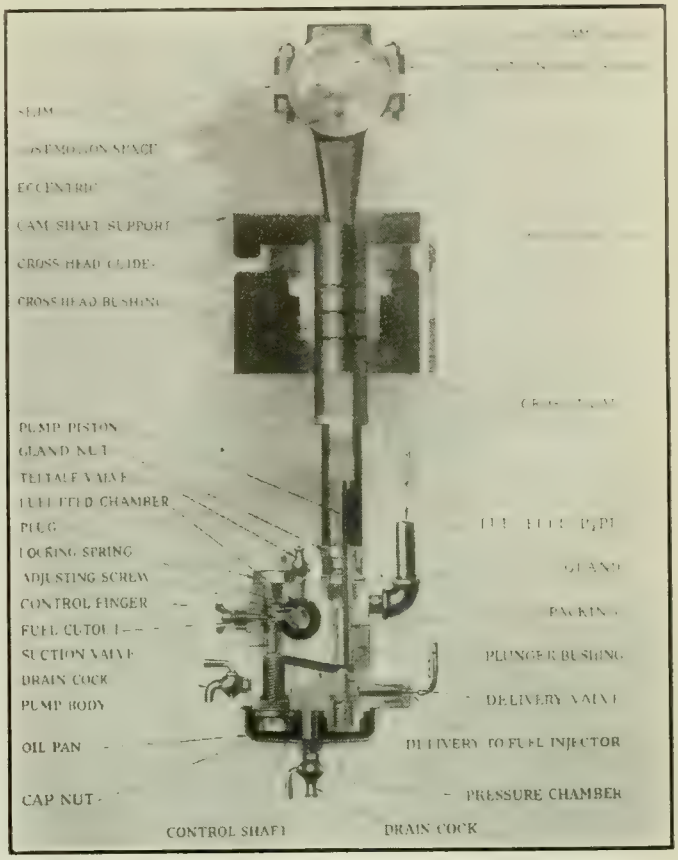
Holding the suction valve open, of course, is the same thing as shutting off the supply, and the speed of the engine is regulated very closely by this means. Each cylinder has the necessary valves for air start, fuel injection, and exhaust, and in addition to these, the two centre cylinders are supplied with air starting valves. These valves can be put on each cylinder if required, and the cylinder head is machined to receive them, but in practice it is only found necessary to use the two mentioned. These valves are all operated from a cam-shaft, driven by gearing from the main shaft. The cams operate levers, which open and shut the valves at the precise period of the stroke necessary to accomplish the various functions. The action of these cams is, of course, exactly the same as on a gas engine or a gasoline engine, with which most of us are familiar these days.

Starting the Engine

In starting the engine the following is about the method of procedure. The reserve air bottles will have been left when the engine shut down with a pressure of about 950 to 1,000 pounds, and will have, perhaps, dropped owing to the cooling of the air to about 800 lbs. or perhaps a little less. The operator first of all raises the relief valves of the cylinders by means of a special lever, which action releases the compression in the cylinders, and allows him to bar the engine round to the air start position. This position is, of course, that in which the air start valves on the two inside cylinders will be open for the admission of air. He then closes the relief valves again, and opens the valve from the air bottle. The engine immediately turns over, and the operator, who has previously seen that the fuel tank is full and ready for the day's work, opens the fuel control valve to give fuel to the pump, and closes off the air start valves by means of a control lever, which puts the air start lever into neutral position. This particular engine usually picks up after a couple of revolutions from dead cold. The operator comes in about ten minutes before starting time, looks at his fuel tank, gives a general look around the engine, and starts her up



SECTION THROUGH AIR COMPRESSOR.



SECTION THROUGH FUEL PUMP.

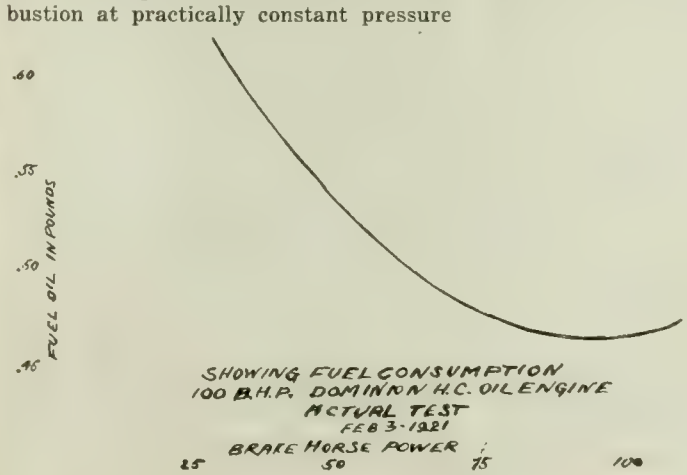
about five minutes to the hour, and is all ready with the current at the switchboard when the shop is ready to start.

Once started, the engine requires practically no attention. The air compressor draws in the air from the atmosphere, passes it over the element containing the air coming from the low pressure stage to the high pressure stage, thus cooling the latter, passes the air through its two stages, the final delivery pressure being from 900 to 1,100 lbs., according to the load being carried. This air is delivered to a chamber on top of the cylinder, and at the proper moment the fuel from the fuel pump is injected into this chamber and the valve from the chamber into the cylinder is opened, and the finely atomised spray of oil fuel injected. Ignition takes place without shock and combustion at practically constant pressure ensues, the gases expanding and driving out the piston. At a point just before the bottom of the working stroke is reached, the exhaust valve is opened, and held open throughout the return stroke discharging the exhaust gases. At about the top of the stroke, the cam closes the exhaust valve, and opens the air suction valve, and the cylinder is filled full of pure air. The valves are then all closed, while compression takes place on the fourth stroke, and at the end of this stroke ignition again occurs.

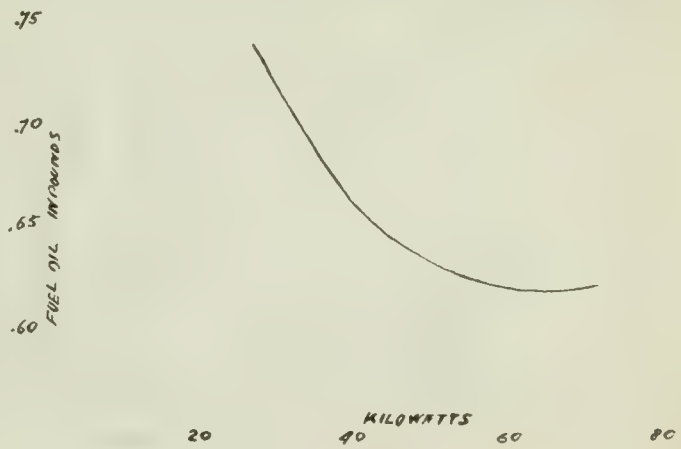
A pump situated in the base of the engine supplies oil under a pressure of ten to fifteen pounds to the crank pin, and through the connecting rod to the wrist pin, while special lubrication is supplied to the piston. The air compressor is lubricated by the oily spray generated in the crank pit by the passing of the cranks through the oil bath, and this is all the lubrication employed for the air compressor.

The accompanying illustration shows the typical indicator cards obtained from this engine, while the section cuts explain very clearly the working parts. Fuel consumption is shown by the curves illustrated here.

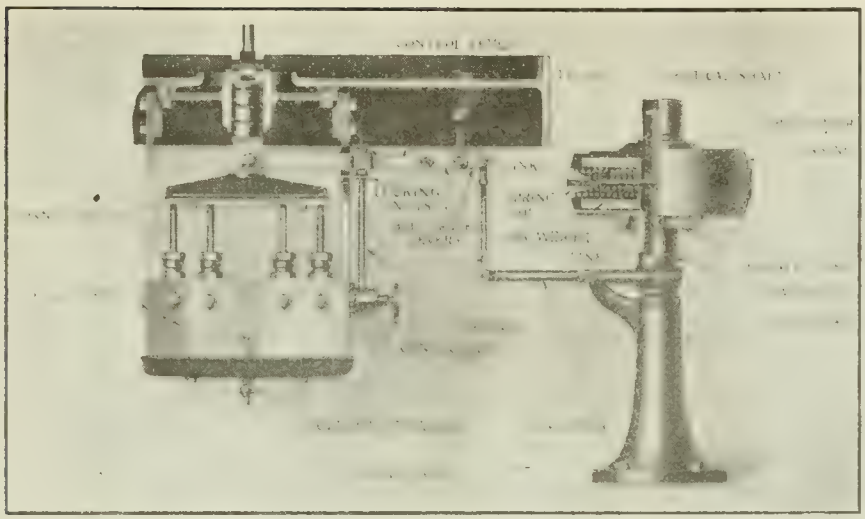
A representative of Power House had the opportunity recently of seeing this engine performing its daily task, and was impressed with its splendid performance under somewhat difficult circumstances. This engine was built with an ordinary sized flywheel, to drive a generator on fairly constant load. The work it is doing now is under very considerable variation of load, from no load to a 50 per



FUEL OIL PER BRAKE HORSE POWER.



FUEL OIL PER KILOWATT.



THE GOVERNOR AND CONNECTIONS.

cent. momentary overload occurring frequently. The speed regulation under these conditions was excellent, and standing at the exhaust pipe, the only indication of anything unusual was a puff of blue smoke. At ordinary load the exhaust was practically invisible, showing excellent conditions.

The Dominion Steel Products are to be congratulated on being the pioneers in Canada of this type of prime mover, and its development will be watched with interest by the engineering profession in general. Mr. Brown, the designer of the engine, gave a highly interesting lecture on the engine before the Canadian Association of Stationary Engineers recently, which was well attended, and discussed with interest by those present.

POINTS ON CONSTANT PRESSURE DIESEL ENGINE.

It can use high compression pressures as it does not compress a mixture.

The mixture is very lean and burns slowly and loss in cooling water is less.

Four gallons of cooling water per B.H.P. ample.

Perfect combustion due to complete atomizing and slow burning.

Oil of high flash point, thus cheap oil can be used.

Typical test data:—

Compression pressure per square inch, 510 lbs.

Mechanical efficiency, 82.5 lbs.

Fuel consumption per B.H.P., .45 lbs.

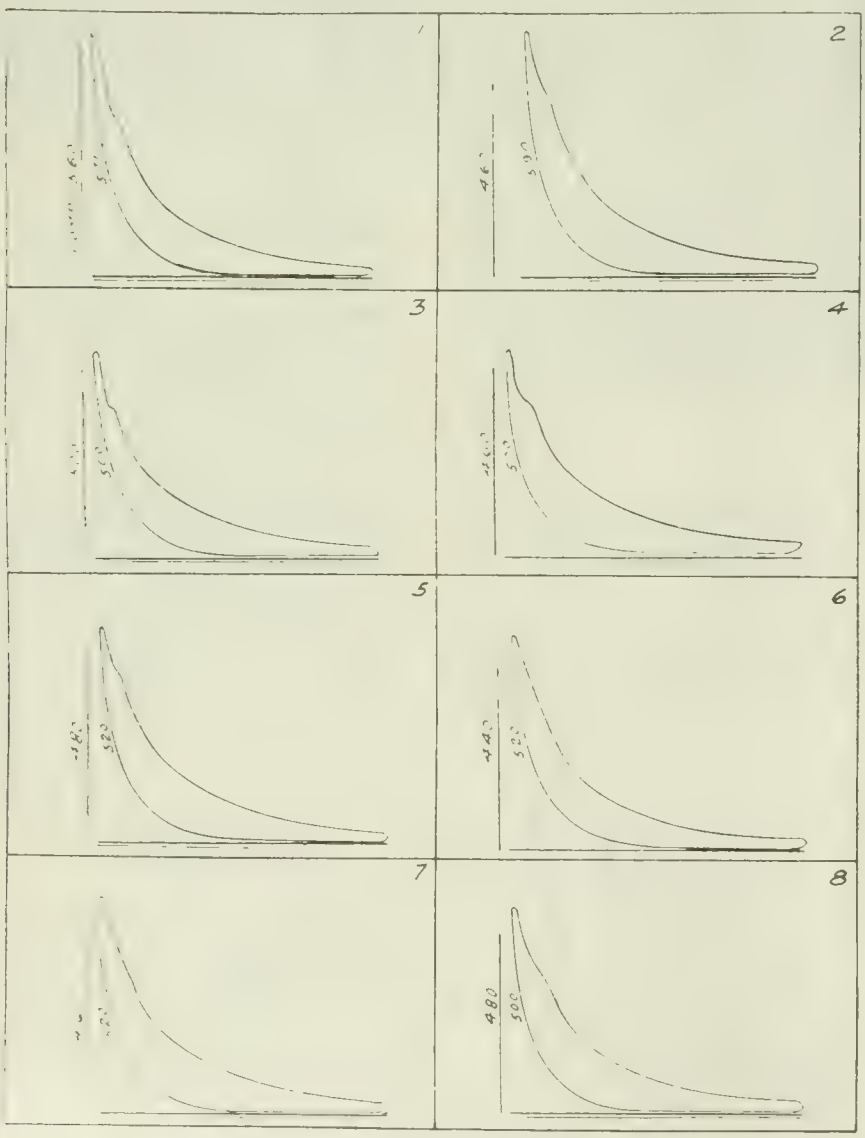
Cooling water Temp.—in, 46 deg. F.

Cooling water Temp.—out, 103 deg. F.

Exhaust gases, temperature, 600 deg. F.

Heat value of fuel, B.T.U., 19,000.

Specific gravity of fuel, B.T.U., 20



TYPICAL INDICATOR CARDS.

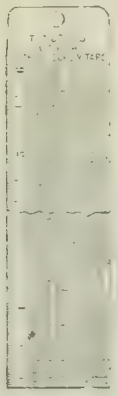
NICKELING ALUMINIUM

A process for nickeling aluminium is described in Annales de Chimie Analytique as follows: The aluminium is immersed for two minutes in a cold solution of ammonia and potassium cyanide. The metal is then well washed and brushed with milk of lime until the surface acquires an even, brilliant white tint. Then the washing and brushing are repeated with water, so as to get rid of all traces of lime, and the metal immersed in an acid bath of manganese, and iron chloride. The metallic coating of iron or manganese which serves as the "mordant," as it were, to fix the nickel to the aluminium, forms upon the aluminium. After two to three minutes' immersion in the acid bath, the metal is rinsed with water and put in the nickeling bath, which consists of nickel sulphate. The anodes are plates of laminated nickel. The electric pressure used should lie between 2.5 and 3 volts, otherwise a non-adherent deposit would be obtained. The current density should be from 1 to 1.5 ampères per square decimetre. The treatment for moderate-sized objects lasts one hour to one hour and a half, and is followed by washing in boiling water and drying by compressed air.

It has been announced that the contract has been let for the erection of a ten-story hotel structure at the corner of London Street and Dougal Avenue, Windsor. Estimated cost $2,188,500.

Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Evidently there was some doubt about question No 6 in the Feb. 24th issue, for only one reader had it correct. The query was, "A reasonable request." Look on Page 31 of that issue and you'll see the request. Reginald Compton, 321 St. Philip St., St. Henry, Montreal, was the only reader who sent in twelve correct answers, so that the scale goes forward to him. We have had several letters stating that scales have not been received. Should there be any other prize winners who have not receivd their scales, write us at once. We have been posting these scales regularly, but for some reason or other they have been going astray. They are now being sent by registered mail, so we should have no further trouble.

CONTEST FOR MARCH 17TH ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

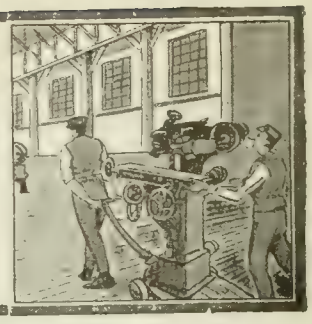
1—Something that has a swing over the bed of 35". Some swing?
2—A product said to be a profitable producer.
3—Something useful in damp localities.
4—How to solve the problem of economic production.
5—Something that is beyond the experimental stage.
6—A product that cuts and draws in one operation.
7—Some valuable inside information.
8—How to make better workmen.
9—Something noted for their efficiency.
10—How to maintain safety, economy and efficiency.
11—Something that has been made for eleven years and is still giving satisfaction.
12—How to handle special jobs away from the air line.

These are Correct Answers for List from February 24th Issue:

1—Canadian Ingersoll-Rand Co.
2—Smooth-On Mfg. Co.
3—Northern Electric Co.
4—Butterfield & Co.
5—Taylor Instrument Co.
6—Gisholt Machine Co.
7—Nicholson File Co.
8—Cleveland Pneumatic Tool Co.
9—Independent Pneumatic Tool Co.
10—Canadian Detroit Twist Drill Co.
11—The Liquid Air Co.
12—Imperial Oil, Ltd.

Closing Date for This Contest is April 7th.

DEVELOPMENTS IN SHOP EQUIPMENT



PATENTED CUTTERS

The Cleveland Cutter & Reamer Co., 1619 Merwin, Ave., Cleveland, Ohio, have placed on the market a line of patented inserted tooth milling cutters as shown in the accompanying illustrations.

The cutter shown at Fig. 1 is known as an inserted tooth side milling cutter and has a machine steel body. The blades are made with a corrugation on the back as shown, and it is claimed that this method eliminates all slipping and tilting, also the packing sometimes used underneath the blades. The blades are said to be so constructed that they can be moved out 50 per cent. farther than various other types with similar results.

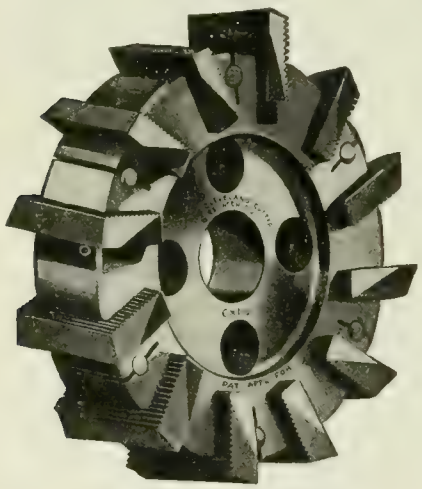


FIG. 1—SIDE MILLING CUTTER.

All blades are interchangeable and can be replaced at small cost.

The face milling cutter shown at Fig. 2 has all the other characteristics of the former styles and is made with both carbon and high speed blades. The blades are set so that they can be easily adjusted when worn. A taper hole, with keyway for driving, is used, but this same style cutter can be made with threaded hole, or to fit milling machine with flanged spindles if so desired.

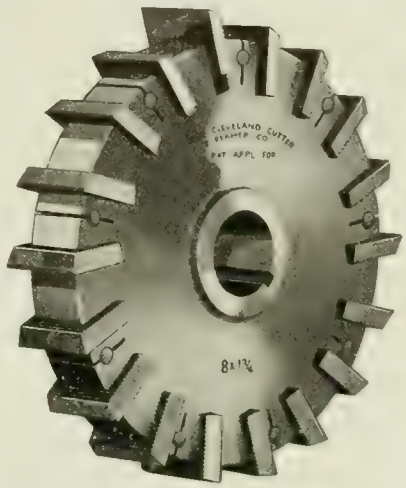


FIG. 2—FACE MILLING CUTTER.

The third example, Fig. 3, depicts an adjustable reamer that is said to be the only reamer that has a double adjustment. Screwing back the lock nuts in back of the blades 5-16 of an inch will give .083 inch adjustment. Placing the blades up one step in the corrugation will give another .083 inch of adjustment. This procedure can be continued until the blades are worn out. The reamers are made with blades set in the body straight as shown, but spiral set blades are made when ordered. They can also be equipped with a float if desired. All sizes from 1 inch to 6 inches, or even over if on special order, can be furnished. The first type of cutter is made in sizes ranging from 6 to 12 inches, while Fig. 2 is made from 5½ inches to 9½ inches. It is, of course, understood that other sizes can be made if desired.

POWER MOWER

The Aikenhead Hardware, Ltd., Temperance St., Toronto, Canada, are now Canadian distributors for the Ideal Power Lawn Mower Co. It might be well to add that these mowers are said to be a new departure, in so much that they are very simple in mechanism, and complete control is effected by two levers. One lever governs the power unit, the other raises or lowers the cutting unit. These mowers are made in various styles, but the type shown in illustration is a hand operated model. When the acreage is large enough, the tractor type is used, these of course cutting a larger swath.

The cutter on this mower is not driven direct from the engine, but the cutting reel is driven by the traction of the mower wheels. The mower is freely suspended from the frame by two side arms, these allowing sufficient play to permit a free tilting motion of the cutter. The wheels, of course, readily adapt themselves to any irregularity of the ground surface. This, of course, eliminates breakages when obstacles are met with.

The engine is the design of R. E. Olds, whose Oldsmobile car is already a well-known type. It is of the air cooled type and is mounted in such a way as to give the least possible vibration. Canadian Machinery saw several letters written by users stating their satisfaction with these machines, and it is hoped to interest all cemeteries, golf clubs, city park authorities, private estate owners, in fact any person having considerable acreage to cut. A list was supplied us stating a number of Canadian users at the present time.

The standard machine shown cuts a swath 30 inches wide and has a speed of 2¾ miles per hour.

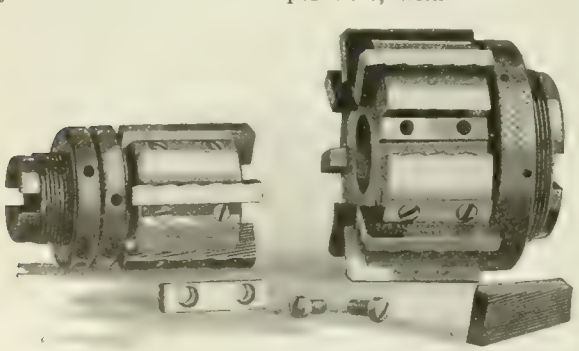
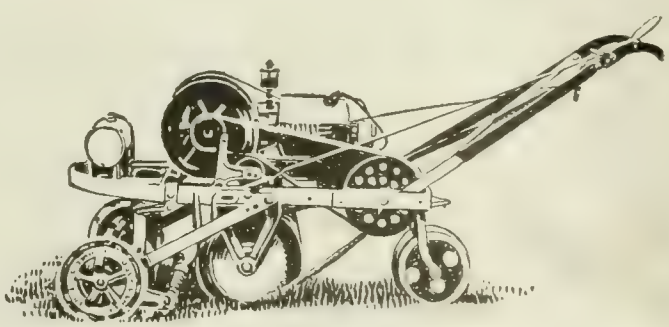


FIG. [illegible] SHOWING THE ADJUSTABLE TYPE OF REAMER.



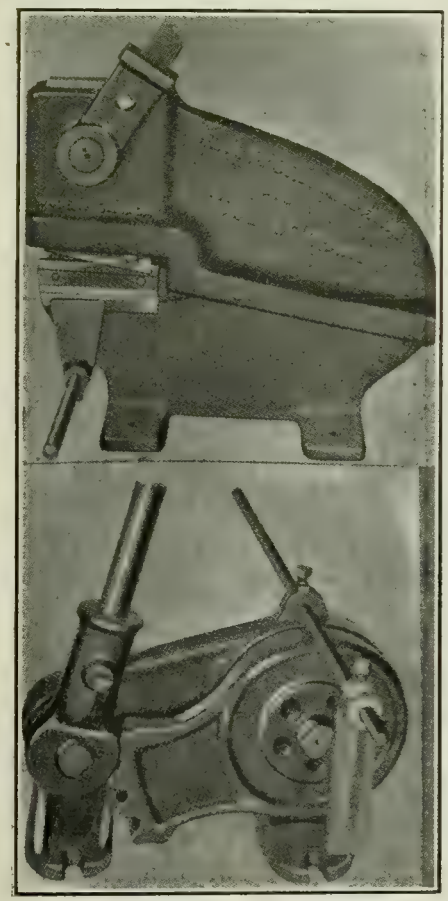
AN OUTLINE VIEW OF THE POWER MOWER.

TWO NEW MACHINES

The Brantford Machine Tool Co., Brantford, Ont., have placed on the market two new machines, both of which are illustrated herewith. Let us first consider the shear. As will be noted this machine is of rugged construction and is made from the best of materials. It has ample leverage for the work it is intended to perform, and the shear is operated from the front. The frame is offset so that the metal will not bend in cutting sheets of any length or width.

The shear blades are reversible, so that the four edges can be used without regrinding. They are also adjustable. The machine is also equipped with a guide stop, and the hold down on the other side is adjustable to thickness, and is reversible, this allowing it to get close to the blade. Such a shear is claimed to be particularly useful in machine shops, sheet iron works, warehouses, tin shops, blacksmith shops, etc. The capacity is quarter plate, the bottom blade 7 inches long, the top one 6 inches, and the weight 240 lbs. Legs are supplied if necessary.

The rod cutter as shown in the other illustration has a capacity up to ⅝-inch diameter. The cutter blades are made of the best grade of steel, properly tempered. These blades are adjustable and may be ground when dull. A stop can be set to cut any number of pieces the same length, and this machine can be used in any shops using rods or wire.



VIEWS SHOWING THE SHEAR AND ROD CUTTER.

NEW THINGS IN MACHINE TOOLS

FLEXIBLE-SHAFT MACHINE

The R. G. Haskins Company, of Chicago, Ill., has recently made some improvements to their flexible-shaft grinding machines for die-sinking. By means of a swivel base the machine can be rotated through a complete circle. This feature, in addition to a special leaf spring support at the motor end of the shaft, assists in eliminating unnecessary bending of the shaft. Trouble is generally developed at the inner end of the shaft, where it connects with the motor shaft, and the added protection prolongs its life.

GRINDING AND BUFFING MACHINE

In the combination grinding and buffing machine brought out by the Cincinnati Electric Tool Company, provision is made for the alternate grinding and buffing of the work without the removal of the wheels, these being fitted to opposite ends of the spindle. The driving motor forms the body of the machine and the motor windings are fully enclosed. Annular ball bearings are fitted to both ends of the armature spindle and also at the extreme end of the extension spindle. All bearings are amply protected from flying dust. The machine can be obtained either with or without the floor stand.

DIE-FILING MACHINE

A new line of die-filing machines, especially adapted for work of a heavy character, has been placed on the market by W. D. Rearwin, of 716 Monroe Ave., Grand Rapids, Mich. The machine is adjustable to a maximum stroke of 7 inches. The table has a surface of 20 by 24 inches and is located 30 inches from the floor. Arms are fitted to the machine for carrying hack saws and heavy sawing can be performed. Filing can be accomplished where the bottom of the work has a shoulder or is closed entirely. The machine can be obtained either for belt drive or fitted with an individual motor. The weight of the machine is about 650 lbs.

NEW STYLE TOOLHOLDER

The Brooke Tool Manufacturing Company, of Birmingham, England, are now making a new tool holder that does not require a set screw for the holding of the small tool bits. The tool-post screw serves the two functions of securing the holder and gripping the tool bit. The holder is self-contained and is so designed that either end may be placed through the tool post. The tool holder is made in two pieces, the clamping portion being retained in position by means of a small pin at the forward end. The tool is made in three sizes.

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CANADIAN MACHINERY
AND MANUFACTURING NEWS

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The Uncertain Steel Market

THE steel market is not in a healthy state, either in Canada or United States, and no good purpose is to be served by claiming anything to the contrary.

The reason is not hard to find—it is, as a matter of fact, lying right on the surface. Neither the buyers, the steel merchants or the steel makers have any confidence in the present situation, particularly in the present price schedule.

We are right in the middle of a sagging market. A careful scrutiny of the markets week after week generally brings to the surface some item that has been more or less whittled and hacked at in order to bring a purchaser to the point where he will place his business.

The steel merchant who wants to liquidate has a peculiar position in the present non-buying market. Even if he is prepared to cut his prices in order to clear out his high-cost material, regardless of whether he breaks even or takes his loss, he has to face the condition of only hand-to-mouth business coming into the market. In plain English, although he wants to liquidate, he can't do it.

One can go over almost the whole run of the iron, steel and metal market to-day, and he will find that there is a feeling of uncertainty as to whether the bottom of the market has been reached. Whether that is really the reason for the attitude of the buyers is open to doubt. Were they in need of iron or steel they would buy and make the best of the price.

The United States Steel Corporation, by adherence to its schedule, has done more than any other agency to keep the steel market both in United States and Canada from running away and losing itself entirely. It has yet to be shown that the raids of the price-cutters have brought an extra ton of business to the books of any of the mills.

Canada's Iron Ore Again

THE Dominion Government spent a couple of hours the other day listening to addresses telling the members how Canada should go ahead and develop her natural resources, make use of her native iron ores, pay bounties for the production of iron ore, pig iron, etc.

There is nothing particularly new in the idea—in fact, it is old and nothing was added to the sum total of what has been said before by the debates at Ottawa this week.

The trouble with this matter is that those who bring it up from time to time have nothing concrete and definite to offer. It is all very well to carry along agitations in certain directions, but unless something tangible is brought out, the agitation will totter and fall from its own weight.

The work of research requires a tremendous amount of patience and persistence, and the Research Council has done splendid work in its first stages. It must be prepared right from the start to go up against popular indifference because the majority of the people in this and any other country are very fond of working along the lines of least resistance, and that is one of the reasons why we are bringing iron ore to our blast furnaces from United States instead of using our own.

The fact that Canadian furnaces and steel mills have to compete with United States mills makes it commercially necessary for them to obtain their raw materials at the point where they can be secured with the greatest degree of commercial advantage. In doing this they have had to ignore Canadian iron ore to a large extent because it would not be possible to treat it and make it fit for use, and then sell the finished product in competition with Buffalo or Pittsburgh.

Let the Government provide facilities and money for experimenters with various processes for treating our refractory iron ores. It takes a great deal of money to carry on this work properly, and few men can afford to do it. For the present the big work of the Government should be toward perfecting a commercial method of using iron ore rather than tossing out temporary sops in the way of bonuses for a tonnage of Canadian ore used or pig iron produced. Once the method is perfected and shown to be workable on a commercial basis, the other matters will take care of themselves.

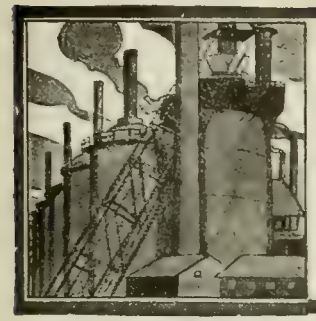
The Condition of Germany

ON another page Canadian Machinery presents the opinions of several Canadian manufacturers regarding the matter of dealing with Germany. Canadian mails are carrying an increasingly large volume of catalogues and sales literature from Germany, and there is a persistent and well-organized effort being made to push German goods in the markets of the world.

One fairly keen student of German conditions has been looking over the pages of some of the German engineering papers, and in one copy of the *Zeitschrift*, of the German Society of Engineers, has found over thirteen pages of advertisements seeking engineering help. Less than a page is occupied with the ads. of those seeking positions.

Among the advertisers are such well-known firms as the General Electric Co. of Germany, Fried. Krupp, Gutehoffnungshütte, Brown, Boveri & Co. (Mannheim branch), the Deutz gas engine works near Cologne, Ehrhardt & Sehmer at Saarbrucken (now, of course, in French control), the Humboldt Works near Cologne and numbers of foundries. The Gasmoteren-Fabrik Deutz includes in its advertisement the request for an engineering representative in Mexico and engineers for the export department.

The whole thing goes to show that there is no special call for this, or any other country, to spill over with sympathy for the bleeding-to-death industrial Germany.



MARKET DEVELOPMENTS

The Markets All Over Lacking Stability

Buyers Are Not Coming in Yet and so it is Hard to Carry on the Programme of Liquidation—New York Has Only a Few Inquiries, While Steel Mills Are Running Low

A SURVEY of the leading markets for the week shows that machine tools, iron, steel and metals are quiet and weaker in price. Just to what extent the price has weakened is impossible to state because in several instances the word "price" indicates now what the buyer thinks he should pay rather than what the seller is asking.

Machine tool sales are limited to single orders, and large installations are not being made. Many factories have taken advantage of the quiet season to go over their mechanical equipment and put in improvements to existing equipment, but this has only led to small buying. Some price shading is reported in the sale of small tools, such as taps, dies, reamers, cutters, drills, etc.

The steel market is in a peculiar position. Warehouses have for some weeks been making an effort to liquidate their stocks to as great an extent as possible, and in an effort to do this, existing selling schedules have not been allowed to stand in the way. It is a difficult matter to liquidate when the buyer is not coming into the market, and as a result progress in this direction has been rather slow. Shipments into this territory from the mills of the U.S. Steel Corporation have been large during the week, and most of this material goes direct to the manufacturers of Canada, and not to the warehouses of the steel merchants. The Corporation has given no sign of any intention to meet the price-cutting practice of the independents.

The scrap metal market remains in a bad way, and a number of the smaller dealers are able to stay in the business only because of their ability to reduce their overhead, and wait until things turn for the better. None of the yards are making money now, and the pressure on some of the less fortunate ones must be getting rather severe.

MONTREAL AGAIN WONDERING WHAT WILL HAPPEN WHEN MAY 1 COMES

Special to CANADIAN MACHINERY.

MONTREAL, March 17.—The agitation now on for an adjustment in the rate of wages paid to railroad employees may result in a settlement that will have a far-reaching effect upon industrial activity. It is possible that some concerted effort on the part of labor may be made to prevent any serious cut in wages, but even among certain classes of labor there is a feeling that some satisfactory arrangement must be made before a general return to industrial activity can take place. However, many are looking forward to May Day with feelings of nervousness, uncertain as to what attitude labor will assume regarding universal reductions. The situation in this district does not carry that degree of tension so marked in other places, but there is always that undertone of restlessness which is more or less evident at this period of the year, and this year a little more emphasized than in the past. The likelihood of the early opening of navigation has relieved the pressure somewhat, as the Montreal Harbor Board is making preparations for early activity; this will gradually absorb many of the unemployed in this district.

Steel Situation a Problem

The many problems involved in working out a solution to the existing steel problem makes the answer a very uncertain one, and the seeming elimination of one factor only brings out another in a different form, so that the final equation, though slightly changed, still contains that unknown quantity—uncertainty. As outlined by one dealer here the question is one of labor and transportation. "The prices quoted by many independent mills," it was stated, "represent figures at which it is virtually impossible to manufacture the material at the present time. This cutting into prices has not stimulated buying to any extent, and it is a question whether many of these mills could accept much business at prices now quoted. There is the possibility that it is an effort to get the U. S. Steel Corporation to make a definite move at price and wage adjustment, but if this is the reason, the move so far has not succeeded, for the Corporation continues to quote the old figures and to pay the high rate of wages of busier times. These wages, in many instances, show an increase of 150 per cent. over those of 1915, and freight charges are fully 100 per cent. above the pre-war rates. For the larger interests, handling every detail of production, from smelting the ore to turning out the finished product, it might be possible to maintain a fairly high wage scale and yet reduce selling prices, but in the case of the smaller mills the haulage charges are items of expense that influence the final selling price." The buying locally shows little or no improvement and dealers are generally optimistic in tone but not in fact. The cheerful outlook of most dealers is for some indefinite period ahead and not for the immediate future. One steel merchant here remarked that a slight betterment was noted in last week's total, but had nothing to say as to steady improvement. "One thing is certain," was one remark made, "and that is, that to get business you have to go after it. Buyers today are only taking what they need today. If they think they will require some article next week, they will wait until next week to buy it."

What Does the Future Hold?

Movement of machine tools and shop equipment is of a quiet character. Buying is confined to single tools or small

quantities of supplies. Manufacturers' needs are few and wherever possible they try to manage with what they have on hand. Running at part capacity, as many of them are doing, they have the advantage of utilizing equipment which under normal conditions would not be available, so that the necessity for spare or stock supplies is not so essential. The remark of one dealer was to the effect that he "would not be surprised to see this dull period extend throughout the entire year," but he also stated that his past week's sales showed a slight increase over previous weeks. The future seems to be anyone's guess, but even if the average "guess" is realized, business may be expected to show improvement before the summer months.

Prices Do Not Effect Sales

Little encouragement has been given to old material dealers by the trend of business during the past week. The situation is much the same as it has been since the beginning of the year, the movement being restricted to purchases sufficient only to tide them over the immediate period, and the volume required for this purpose is relatively light when compared with normal times. Dealers here are getting a little nervous at the extended period of dullness. In the opinion of dealers, consumers would find this a good time to buy, as the former state that prices cannot go much lower. However, demand from users of scrap does not reflect this attitude of the dealer, so that activity in old materials must remain as it is until the reaction of present dullness takes place. "It does not matter much what price is quoted, as buyers apparently are not interested. Those quoted are nominally correct, but we regulate the price for each sale transacted." This remark by a dealer reflects the listless condition of the market and trading will probably continue quiet for a month or six weeks.

KEEN SELLING IN SEVERAL LINES

Business Going to Those Keenest to Get It, and Price Quite a Consideration

TORONTO.—February showed an improvement over January in nearly all lines of business in this district, and in a good many this improvement is being maintained in March. From this it is not to be concluded hurriedly that business is quickly on the up-grade, or anything approaching it, but there is a better showing in several places, and in no place that Canadian Machinery inquired was there any retrograde movement.

Machine tool houses are not getting any large orders. There are some machines going out, and there is quite a list of inquiries in the market, in fact this list is growing to very fair proportions. One dealer recently was preparing a number of propositions to be sent out on prospects that he was definitely sure would come into the market within a reasonable length of time.

Firms handling used machinery are having a fair demand for odd pieces of equipment, and one house reports the sale of quite a number of chucks, chain blocks, etc.

It is safe to say that the whole territory is being more thoroughly worked than for some time past. As stated in previous reports, the buying that is being done is all more or less small.

Number of Small Orders

Small tools are being bought sparingly, and there is particularly keen competition. As is generally the case when competition gets very keen, there are plenty of rumors in the market of prices that have been shaved when it looked as though business were going to slip by if strict adherence to a price were insisted upon. "It is hard to say where this is being done," remarked one dealer, "but there is a very clear feeling in the trade that there is quite a bit of it going on just now. No one claims that it brings out any more business, and it all works out to the advantage of the buyer. Of course it is a buyer's market just now, and the latter is taking advantage of it."

Then there are a number of resales of small tools being made in this district. Firms bought some months ago rather heavily, feeling that in order to keep their plants running they should have a good stock of all sizes, and they also feared that they might not be able to get them readily were the demand to keep up as it was at that time. This material was taken in at a figure quite a little higher than that prevailing now. So when they get a chance to unload any of their material they are ready to do so. In this way they are turning a certain amount of their stock into cash, even if they have to accept a loss when present selling prices are put over against the price at which they bought in the first place.

Another report has it that one railroad order of fairly large dimensions brought down a figure that was considerably lower than anything that has been named for some time. These reports of price shading must not be taken to indicate that they are the general practice of the market. Prices have not been officially altered for some months, and the great bulk of business is being done at these figures.

Steel Market Quiet

The improvement which seemed apparent in the steel business a couple of weeks ago is not being particularly well maintained, and business is quiet this week.

"We have been making an effort to liquidate our stock," remarked one merchant recently. "We believe that it is the right and proper thing to do, and we are making an honest attempt to do it, but will you tell me this, how are we going to liquidate when people are not buying? All the yards around here have the same idea just now. They want to get rid of their stocks, and are willing to meet the buyer half way in order to do it. What happens? Every little order that comes along now is peddled around until it can't walk any farther. Then it is taken in at a price, and one yard only gets a chance to make the sale and reduce stock to that extent. If some one will come along and tell us how to liquidate when there is very little buying being done, they will settle for

POINTS IN WEEK'S MARKETING NOTES

Production at the steel mills remains at about the same rate as last week. Unfilled tonnage continues to recede, and business booked is not keeping up with production.

It seems to be fairly well established that $25 is going to be the recognized price for pig iron in most of the leading points in the United States.

Canadian steel mills are not running more than half capacity. One furnace is likely to keep on making pig iron and stacking it.

Machine tool builders in Canada are not getting much business at present. The buying of the Canadian railroads, counted upon some time ago, to help out, has been rather small all through.

Scrap metal prices are simply nominal, and the volume of business being done continues very small. There is nothing in sight to indicate that better times are coming soon for this business.

Some pretty keen selling is being done in the small tool business, and some of the dealers claim that prices are going by the board in several cases in order to land orders.

Only a limited inquiry has come to the New York machine tool markets lately, and business continues dull there.

A number of Canadian machine tool dealers report that they have more inquiries on hand now than for some time past, and most of them represent legitimate prospects.

us the biggest problem we have to face just now."

Competition is very keen for anything that shows up. Buffalo warehouses are after anything they can get from the power development in the Niagara district, offering in many cases to meet and go one better on any price offered by the home firms.

Mills are looking for business harder than for some time past. In many cases it would seem that the mills are competing with the warehouses, as they are taking in orders of a size that were formerly regarded as the property of the warehouses, and so small that the mills did not consider them worth while.

There is a fair business going in tubes. Since the first of the year about 75 per cent. of the business done in this line has been for marine work, and there has been very little coming in from industrial plants. According to seasons there should be orders arriving now for industrial plants. Then there are construction firms that must get their equipment —especially that used in field work—in shape for the season. There are some orders going through for reinforcing material. Contracts for buildings are slow in being closed, and some hold that the amount of floor space available in the city now for industrial purposes is making it unnecessary for other firms to build, although it is also a fact, according to real estate men, that these vacant places are being held at a good figure, showing little, if any, recession from last year's high figures.

Prices Are the Same

There is nothing to indicate that the steel market, in spite of the keenness for business, is out of hand, or that it is running away. The attitude of the Steel Corporation is still the controlling factor in the situation, and they have so far stood pat on their schedule. Canadian mills are not well employed at present, some of them not operating at half their capacity. Some of the furnaces, it is understood, are still operating without many orders, it being the intention to go ahead and stack a certain amount of pig iron against the time when business conditions shall improve. The price of $39.25 remains as the quotation for No. 1 foundry.

The Scrap Metal Market

There is nothing better for the scrap metal trade this week, and they are simply marking time, and hoping for a better break soon. Some of the smaller men in the business are being badly pinched just now. Present prices are so low that it hardly pays them to keep operating on any scale. The larger dealers to whom they are accustomed to sell are not taking on stock. The fact that they can get down to little or nothing in the way of overhead expenses is helping to keep a number of the little fellows alive in the scrap metal business.

NO INDICATION THAT CORPORATION IS GOING TO BREAK FROM ITS PRICES

Special to CANADIAN MACHINERY.

PITTSBURGH, March 17.—There is a distinct, though small, increase in the volume of buying of some steel commodities, this improvement being most marked in the case of sheets. The improvement was predicted at the beginning of the year, being based chiefly on the progress of the season, as demand always becomes more active on the approach of spring. In January, however, a greater improvement was expected than now seems likely to develop.

Improvement, however, does not make the steel market active by any means, since it was entirely stagnant. The increased buying is in miscellaneous quarters, there being no large projects. Some of the business received, and counting as part of the improved demand, is in the form of releases to shipments formerly suspended. The strictly new buying is still conspicuously light, though not altogether as light as two or three weeks ago.

Production

The process continues of old orders running out, and accordingly the increase in buying and the releases against suspensions are not sufficient to arrest the decline in actual production. The monthly report of the American Iron and Steel Institute, giving the steel ingot output of the thirty steel companies that make monthly reports, indicates that steel ingot production during February was at the rate of about 25,150,000 gross tons a year. The Steel Corporation produced at 76 per cent. of its capacity and the independents at 26 or 27 per cent. of their capacity, making a total for the industry as a whole of about 48 per cent. The percentage is not nearly as bad as it seems, for it does not mean 48 per cent. of any actual production that has been realized. The steel industry has not been able to operate at capacity since 1916, there being either shortage of orders or physical difficulties. In the first nine months of 1920, when steel was scarce, the average operation was only about 80 per cent.

Production at the present time is lower than the average rate of February, being approximately at the rate of 21,000,000 tons a year, or just one-half the rate during the first nine months of last year. Considering how active the demand then seemed to be, and how completely absent demand now seems to be, this really looks like a high rate. Although the independents started cutting prices early in February while the Steel Corporation has maintained its prices, the production rates now are about 13,500,000 tons by the corporation and 7,500,000 tons by the independents, so that the corporation is making about 65 per cent. of the steel although it has only about 43 per cent. of the capacity.

Steel Corporation Orders

The Steel Corporation's unfilled obligations decreased during February by 639,297 tons, against decreases of 574,958 tons in January, 873,359 tons in December and 815,371 tons in November. The February decrease represented 51 per cent. of the month's capacity, and as shipments may be estimated at 75 per cent. of capacity the net bookings in the month appear to have been about 24 per cent. of capacity. The net bookings are, of course, the total bookings minus cancellations, of which there were few in February or January. In November and December there was a very considerable quantity of cancellations, some of the cancelling being by initiative of the corporation of orders that seemed unlikely to represent actual shipments within a reasonable time. That the Steel Corporation should book any business at all when the independents were cutting prices shows that the corporation's customers are quite willing to stay with it, expecting they will profit in the long run, as in the past, by doing so.

Prices

Bars, shapes and plates are quotable at the same prices as a week or two ago, 2c for bars and 2.10c for plates or shapes. Generally a very ordinary sized order can be placed at these prices, but the specifications have to be fairly attractive. Plates and shapes are no stronger than a week or two ago, but bars are apparently a shade stronger, since an extreme concession from the 2c price would be $1 or $2 a ton, for a very attractive order, while three or four weeks ago it appeared that 1.85c could probably be done on a large order.

Sheets, on the other hand, are easier. Ten days ago the market on fair-sized lots with reasonably definite specifications was about 3.20c for blue annealed, 4.10c for black and 5.20c or 5.25c for galvanized. Now it is possible to do 3c, 4c and 5c respectively, and in some quarters it is believed that the 4c price on black could be shaded. The spread between black and galvanized is narrowed down to about $1 per 100 pounds, when the Industrial Board spread was $1.35. The decrease is attributable largely to the low price of zinc, which is 4.80c, St. Louis, or lower than the average price in any calendar year since 1902 with the exception of 1908.

Tin plate remains at the old price of $7 per base box, 100-pound, all efforts of buyers to break the market having failed. The mills hold together because they realize that if any accident should happen to the regular price there would probably be a decline that would prevent the mills from realizing cost out of their high-priced tin bought before

the decline to the present remarkably low price and might make them experience a loss beyond that.

Standard steel pipe also remains at the old price, the market still being quotable at a basing discount of 57½ per cent. Demand has held up better for pipe than for any other finished steel commodity, although by this time even pipe demand is rather light. There is shading on some other descriptions of tubular goods, particularly on line pipe.

Pig Iron

Another 50-cent decline is recorded in the foundry pig iron market, as the Standard Sanitary Manufacturing Company has bought 1,000 tons of valley foundry iron on the basis of $26, furnace, for its New Brighton plant, near Pittsburgh. At the same time this interest bought 1,000 tons for its plant at Louisville, Ky., taking half from Virginia furnaces at $26, furnace, and half from Birmingham furnaces at $25, furnace, the last named price being $1 under the Birmingham market as previously quoted.

Basic iron remains nominally quotable at $25, valley, and Bessemer at $27. These are quotations of merchant furnaces. It is thought probable that some steel works would sell from their surplus stocks of basic at about $23. A careful canvass of the situation made by a producer shows that just now there is no real price issue as between producer and consumers, the consumers stating that they have no inclination to buy. Some have no orders against which they could use iron, while others have a few orders but have considerable tonnage of pig iron due them on old purchases, some of this iron being at as high as $40. A 500-ton lot of basic iron has just been sold by a broker at approximately $23, valley, but such a sale would not be representative of the market.

FEW REDUCTIONS MADE IN NEW YORK

But for the Most Part the Makers Are Taking No Action in Price Reduction

Special to CANADIAN MACHINERY.

NEW YORK, March 17.—While the machine-tool markets are still dull, there is a trifle more life to some of the inquiries now being received. The principal inquiry before the trade is that of the American Sugar Refining Company, New York, which will buy about fifty tools for its maintenance shop at the Baltimore, Md., refinery. The New York Central Railroad is in the market for four large tools and the Virginian Railroad is inquiring for ten or twelve tools. The Santa Fe Railroad, which recently purchased about $125,000 worth of machine tools for its shops at Albuquerque, New Mexico, is now in the market for four cranes, including one of 250 tons capacity.

A Few Reductions

A few price reductions have been reported within the past two weeks, but the majority of leading manufacturers are taking no action toward reducing prices, believing that reductions at this time would not stimulate buying. The general opinion in the trade is that no activity of importance in the machine-tool trade may be expected within the next two or three months; hence the trade is simply marking time until business conditions have improved sufficiently to bring buyers back into the market in sufficient numbers to insure at least a moderate amount of buying.

Railroads are expected to come into the market some time this year, but it is known that there will be little buying until the roads are in better financial condition. One step in that direction is the reduction in wages now going on. Some of the roads haven't enough money to pay their bills, and when payments are received from the Government under the terms of the Winslow Bill, recently passed by Congress, it will go out mostly in liquidation of debts which have been on the books for periods ranging from a few months to a year. Just as credit and transportation brought about the crisis less than a year ago, so to-day the situation as to credit and transportation must show considerable improvement before there can be stable business conditions again.

Pig Iron Market

Pig iron prices have again receded whenever tested, and Southern iron is down to a basis of $25, or $1.50 lower than the prevailing quotation of the preceding week. Some furnaces unable to obtain shipping orders on iron sold some time ago are willing to sell additional tonnages at low prices in the hope of speeding up deliveries on old orders and striking a fair average price on new and old business.

On the Pittsburg market one company recently closed for about 2,000 tons of foundry iron, for its plants at New Brighton, Pa., and Louisville, Ky., about 1,000 tons going to each plant. This is the only important business which has taken place during the week and is important because it brings out lower prices than have recently prevailed. The iron for delivery immediately was placed at $26, valley furnace.

The condition of the Chicago market is unstable to a marked degree. A sale of 200 tons of No. 2 foundry was closed last week at $27, Chicago furnace, while early this week a carload of No. 1 material changed hands at $26, Chicago, or the equivalent of $24.75 for No. 2 foundry.

An inquiry on the New York market for 500 tons of No. 2 plain pig iron for prompt delivery brought keen competition among a number of buyers, and the business was placed by a large machinery company at $26, delivered, or $24.46 furnace.

The Cleveland market shows a little improvement in the demand for prompt shipment foundry iron from consumers who have no iron coming under contracts, and who are buying in small lots as needed. These orders are mostly for car lots. Prices have declined and No. 2 foundry is now freely quoted at $26 by a valley furnace.

Philadelphia reports a sale of 500 tons of No. 2 plain by an Eastern furnace at $24.50 furnace, or $26.04, delivered to a plant at Phillipsburg, N.J. Special considerations were involved in this sale. Otherwise the foundry iron market may be quoted at $26 for No. 2 plain and $27 for No. 2X, f.o.b. furnace, these prices ruling on nearly all of the transactions of the past week.

Scrap Metal Market

The tendency of the scrap market is still downward and consumers are remaining out of the market. On the Chicago market railroads are offering fairly large lots on which they are receiving extremely low bids, but their present need of money is causing them to accept these prices. The scrap is going into yards and dealers figure they can obtain a profit by holding it.

Prices on many grades at Boston are only nominal, as transactions have been so few during the past two weeks.

Philadelphia market shows a slightly improved market as regards buying, but of a hand-to-mouth character. The total was comparatively small, and production of scrap continues greater than consumption, despite the belief that was prevalent among dealers that prices were at the bottom.

Speculators on the Buffalo market who purchased scrap freely a short time ago are facing a loss, due to the further weakening of the market and a new bottom to prices. A local mill is picking up a few choice shipments of No. 1 heavy melting steel at $13.50. Dealers are not anxious to sell, but some tonnages are available.

Buying is at a standstill at Cleveland, in the scrap metal grades, and the only movement of material is on old contracts and in limited tonnage. Prices are unchanged, but indications point to lower quotations.

The Southern scrap iron and steel market is still inactive. A slightly encouraging feature is that the rolling mill at East Birmingham has been getting in orders for bar iron. The plant operates almost entirely on old material. Consumers of heavy melting steel are out of the market, and other melters are buying sparingly.

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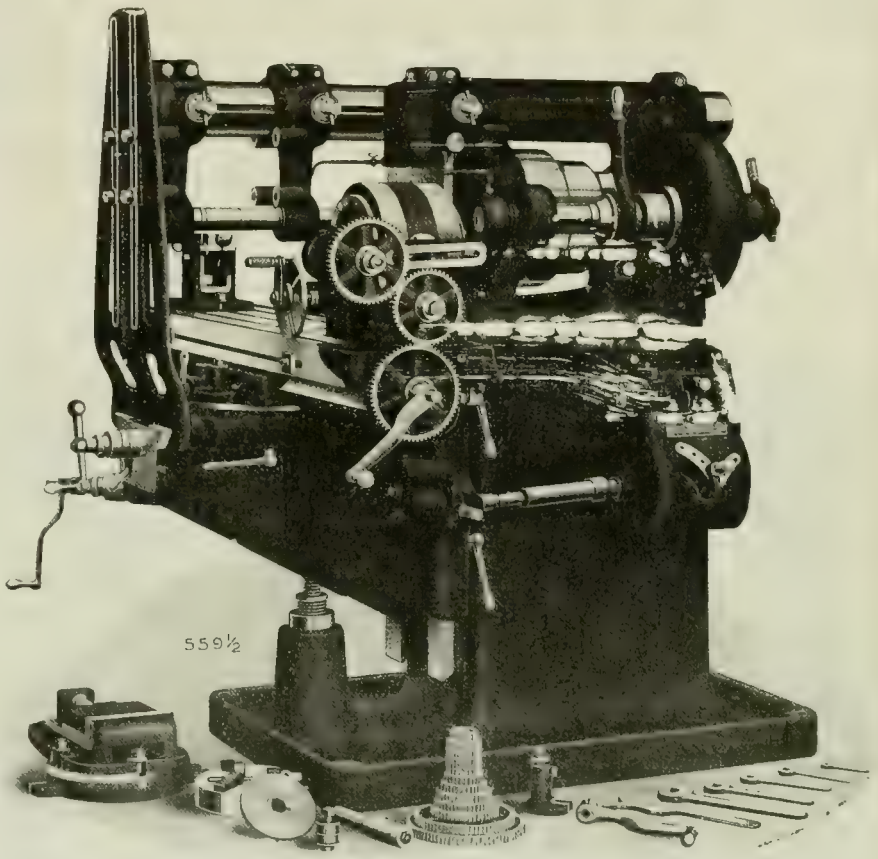

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Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25 per cent.; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

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When Writing Advertisers Please Mention This Paper

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$26 00
Lake Superior, charcoal, Chicago	40 50
Standard low phos., Philadelphia	41 50
Bessemer, Pittsburgh	28 96
Basic, Valley furnace	26 00
Toronto price:—	
Silicon, 2.25% to 2.75%	39 25

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 50
Steel bars, base, Toronto	4 50
Iron bars, base, Montreal	4 25
Steel bars, base, Montreal	4 25
Reinforcing bars, base	4 50
Steel hoops	6 00
Tire steel	5 00
Spring steel	8 00
Band steel, No. 10 gauge and 3-16 in. base	5 50
Chequered floor plate 3-16 and heavier	7 50
Bessemer rails, heavy, at mill	2 35
Steel bars, Pittsburgh	2 10-2 25
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 48
Structural shapes	3 58
Plates	3 78
Small shapes under 3-in.	3 48

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Per 100 Pounds.

Pittsburgh to Following Points

	C.L	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

Current surcharge, 9 per cent.

METALS

	Gross. Montreal	Toronto
Lake copper	$18 00	$17 50
Electric copper	17 50	17 50
Castings, copper	17 25	18 00
Tin	37 00	40 00
Spelter	7 75	7 50
Lead	6 50	7 50
Antimony	8 00	8 25
Aluminum	34 50	30 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$5 25	$5 25
Plates, ¼ up	4 75	4 75

PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

	Steel		Gen. Wrought Iron	
	Blk.	Galv.	Blk.	Galv.
⅛	$ 6 50	$ 8 50	$.....	$.....
¼	5 31	7 41	5 91	8 01
⅜	5 31	7 41	5 91	8 01
½	7 10	8 63	7 95	9 48
¾	8 80	10 87	9 95	12 02
1	13 01	16 07	14 71	17 77
1¼	17 60	21 74	19 90	24 04
1½	21 04	25 99	23 79	27 84
2	28 31	34 97	32 01	38 67
2½	44 75	55 28	....	....
3	58 52	72 29	....	....
3½	74 06	90 62	....	....
4	87 75	107 37	....	....

Standard Lapweld Pipe

Per 100 Ft.

	Steel		Gen. Wrought Iron	
	Blk.	Galv.	Blk.	Galv.
2	$32 01	$ 38 67	$35 71	$42 37
2½	48 26	58 79	64 11	64 64
3	63 11	76 88	70 76	84 53
3½	75 90	92 46	85 10	101 66
4	89 93	107 55	100 83	120 45
4½	1 05	1 29	1 30	1 54
5	1 22	1 50	1 52	1 80
6	1 58	1 95	1 97	2 33
7	2 06	2 53	2 53	3 01
8L	2 16	2 66	2 66	3 16
8	2 49	3 07	3 07	3 64
9	2 98	3 67	3 67	4 36
10L	2 77	3 41	3 41	4 05
10	3 56	4 39	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

OLD MATERIAL

Dealers' Average Buying Prices

	Per 100 Pounds. Montreal	Toronto
Copper, light	$ 9 50	$ 9 00
Copper, crucible	11 50	11 00
Copper, heavy	11 00	11 00
Copper wire	11 00	11 00
No. 1 machine composition	10 00	9 75
New brass cuttings	7 00	8 00
Red brass turnings	8 00	8 00
Yellow brass turnings	6 00	6 00
Light brass	5 00	5 00
Medium brass	6 00	6 00
Scrap zinc	4 00	4 00
Heavy lead	4 50	4 00
Tea lead	2 00	2 00
Aluminum	12 00	10 00

	Per Ton	Gross
Boiler plate	$11 00	$12 00
Heavy melting steel	15 00	14 00
Axles (wrought iron)	25 00	20 00
Rails (scrap)	15 00	14 00
Malleable scrap	20 00	20 00
No. 1 machine cast iron	30 00	25 00
Pipe, wrought	8 50	8 00
Car wheel	30 00	25 00
Steel axles	20 00	18 00
Mach. shop turnings	8 00	6 00
Stove plate	23 00	20 00
Cast boring	5 00	7 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	Net list
Carriage bolts, ⅜" and less	15
Coach and lag screws	—20
Stove bolts	55
Wrought washers	—25
Elevator bolts	Net
Machine bolts, 7-16 and over	—5
Machine bolts, ⅜-in. and less	—30
Blank bolts	Net
Bolt ends	—5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	Net
Machine screws, o. and fil. hd., brass	Net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 25
Nuts, hex., tapped	add 2 75
Copper rivets and burrs, list less.	27½
Burrs only, list plus	10
Iron rivets and burrs	37½ and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	67½
Wood screws, flat, bright	67½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	Less 40%
Square and hexagon head cap screws	Less 30%
Round head cap screws	Plus 10%
Fillister head cap screws	Less 10%
Flat head cap screws	Net list
Button head cap screws	Plus 10%
Studs	Less 20%
Semi-finished nuts up to and including 1-in.	Less 35%
Semi-finished nuts 1⅛ to 1½"	Less 30%
Semi-finished nuts 1⅝ to 2 in.	Net list
Coupling bolts	Plus 10%
Taper pins	Less 40%
Planer bolts without fillet	Plus 40%
Planer bolts with fillet	Pus 50%
Patch bolts	Plus 80%
Hollow set screws	Plus 20%
Thumb screws	Less 35%
Thumb nuts	Less 65%

BILLETS

F.O.B. Pittsburgh.

	Per gross ton
Bessemer billets	$43 50
Open-hearth billets	43 50
O.H. sheet bars	47 00
Forging billets	48 50
Wire rods	57 00

NAILS AND SPIKES

Wire nails, base	$5 10
Cut nails, base	5 75
Miscellaneous wire nails	50%

ROPE AND PACKING

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 26
British Manila rope	0 20
New Zealand hemp	0 20

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	Net

OUR FRIENDS

THE GREAT POPULARITY OF GEOMETRIC SCREW CUTTING TOOLS HAS BROUGHT THEM TO US

Thousands of Screw Machine users have come to know The Geometric Tool Company through the perfect work performed by the Geometric Automatic Adjustable Die Heads and Collapsing Taps.

Connecticut Section of the A.S.M.E., Guests at the Works of The Geometric Tool Company

A demonstration of the efficiency of Geometric Tools was made. You can make a like demonstration right in your own shop. Let screw thread cutting be the most satisfactory operation there.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered.

MISCELLANEOUS

Solder, strictly	$ 0 25
Solder, guaranteed	0 27
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	17 00
Red dry lead, 100-lb. kegs, per cwt.	13 00
Linseed oil, boiled, single bbls.	1 03
Wood alcohol, per gal.	2 75
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire size	40 and 5
Can. carbon cutters, plus	10
Standard drills, all sizes	40 and 5
3-fluted drills, plus	10
Jobbers' and letter sizes	40 and 5
Bit stock	50
Ratchet drills	10
Pure turp., single bbls., gal.	1 20
Linseed oil, raw, single bbls.	1 00
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	Net
Bridge reamers, carbon	50
Centre reamers	5
Gasoline, per gal., bulk	0 42
Chucking reamers	Net
Hand reamers	10
High speed drills, list net to plus	20
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At Warehouse]

Rounds and squares	$7.00 base
Hexagons and flats	7.00 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	26	36
Class C	17	26

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 8 00	$ 6 50
Sheets, blue ann., No. 10	6 50	6 00
Canada plates, dull, 52 sheets	12 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz., galvanized	....	.....
Queen's Head, 28 B.W.G.	11 50	.....
Fleur-de-Lis, 28 B.W.G.	10 50	.....
Gorbal's Best, No. 28	....	.....
Colborne Crown, No. 28.	....	.....
Premier, No. 28, U.S.	10 00	9 00
Premier, 10¾-oz.	10 50	9 40
Zinc sheets	13 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClennand, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES

Size	Seamless	Lapweld
1 in.	$26 00	$.....
1¼ in.	27 25	.....
1½ in.	26 25	29 50
1¾ in.	29 75	27 00
2 in.	29 25	25 50
2¼ in.	33 00	28 50
2½ in.	44 75	31 50
3 in.	49 25	40 00
3¼ in.	.....	48 50
3½ in.	63 50	43 50
4 in.	85 00	55 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS

Castor oil, per lb.	—
Royalite, per gal., bulk	28
Palacine	31
Machine oil, per gal.	58
Black oil, per gal.	27
Cylinder oil, Capital	1.01
Petroleum fuel oil, bbls., net	11.2

BELTING—No. 1 OAK TANNED

Extra heavy, single and double	15%
Standard	15 and 10%
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 50
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	8¾
Pumice, ground	06
Emery glue	30
Tripoli composition	9½
Crocus composition	12
Emery composition	11
Rouge, silver	64
Rouge, powder, nickel	38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	8½
Grits, 80 and finer	6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	30
Brass sheets, 24 gauge and heavier, base	38
Brass tubing, seamless	42
Copper tubing, seamless	44

XXX Extra	.21	Atlas	.19
Peerless	.22	X Empire	.15
Grand	.21½	Ideal	.18
Superior	.21½	X Press	.13½
X L C R	.16½		

WASTE

Colored

Lion	.13½	Popular	.10½
Standard	.12	Keen	.9
No. 1	.14		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20	Dark colored	.09
Mixed colored	.10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard	10%	Best grades	15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$30 00	$34 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	32 00	38 00
Copper sheet, tinned, 14 x 60, 14 oz.	38 00	42 00
Copper sheet, planished, 16 oz. base	44 00	48 00
Braziers', in sheets, 6 x 4 base	36 00	41 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$ 9 50	$14 50
Sheets, 3½ lbs. sq. ft.	9 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	9 00	13 50

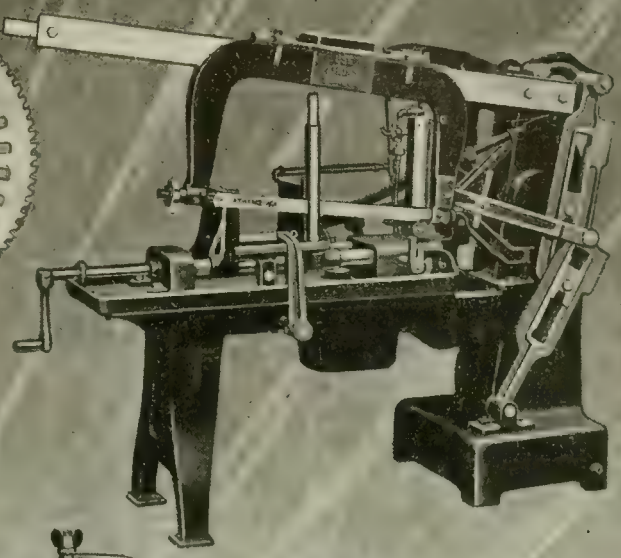
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, hydrochloric	.03¾
Acid, nitric	.10¼
Acid, sulphuric	.03¾
Ammonia, aqua	.20
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.18
Copper, carbonate, annhy.	.35
Copper, sulphate	.10
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	16½
Nickel carbonate	.30
Nickel sulphate	.17½
Potassium sulphide (substitute)	.40
Silver Chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite per 100 lb.	6.50
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated

ATKINS STERLING QUALITY SAWS



O'er Land and Sea
North South East West

Atkins Sterling Quality Saws

are noted for their efficiency. Their use will increase your production.

Ask for new literature describing Atkins Kwik Kut Power Hack Saw and Metal Cutting Band Saw Machines, Circular Metal Cutting Saws, AAA Hack Saw Blades and Frames, etc.

"A Better Saw For Every Use"

Write for Catalog

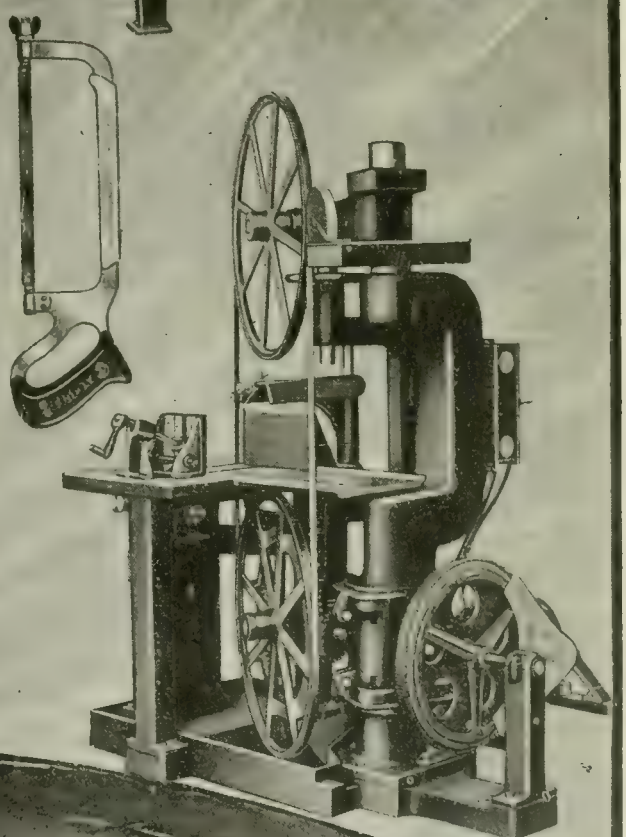
E. C. Atkins & Co.

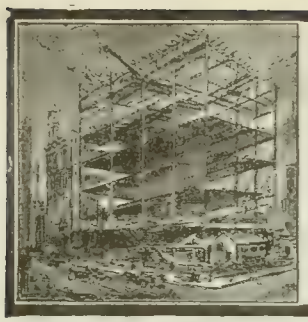
Established 1857

"The Sterling Quality Saw People"

Factory: HAMILTON, ONT.

Branch: VANCOUVER, B. C.





INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

Engineering

A sash and door factory will be built by the Lord Bros. at St. Norbert, Man.

A garage and workshop are being planned by Thomas McNeil, Tyron, P.E.I.

Plans are being prepared for a workshop costing $60,000 for the city of Ottawa. Tenders will be called shortly.

The Winnipeg Supply & Fuel Company, 405 Canada Building, are planning the erection of a warehouse at cost or $60,000.

The Gove Motor Car Company, Tilbury, Ont., are contemplating construc the erection of a warehouse at cost of $50,000.

Work will be started in the near future on the erection of a foundry for the National Castings, Limited, Belleville, Ont.

A direct street car line to link up the southern sections of Windsor, Walkerville and Ford with main service is suggested.

An athletic stadium is to be erected on the corner of King Edward Avenue and York Street, Ottawa, at a cost of $350,000.

The Southern Ontario Gas Company have announced recently that they are planning to erect a large artificial gas plant at Dutton, Ont.

A warehouse is contemplated at a cost of $5,000 by Chas. Fitzpatrick, of St. Louis Grain & Feed Company, 2105 St. Lawrence Boulevard, Montreal, Que.

A permit has been issued for a building on St. Joseph Street, Quebec city, to be occupied by the Woolworth Company's stores, at a cost of $125,000.

The McIlroy Belting & Hose Company, Hammond, Ind., are opening up a branch office at Kingsville, Ont., and will instal equipment to cost about $20,000.

Construction of the $75,000 garage and repair shop for the Consolidated Motors Company, Toronto, will be commenced about April 1. Thomas Sharpe has the contract.

Bremner Norris, 65 McGill College Avenue, Montreal, has been awarded the contract for alterations and addition to factory costing $20,000 for Arlington Company of Canada, Limited, 120 St. James Street.

WILL DOUBLE PLANT CAPACITY

Smiths Falls Concern Has Had Substantial Growth and Plans for More Capacity

Smiths Falls.—The recent re-incorporation of the Smiths Falls Malleable Castings, Limited, the second oldest malleable castings concern in Canada, is in line with a proposed broadening out policy and programme of expansion.

The company was started in 1878 by Wm. H. Frost and Chas. Jones with a capital of $2,500. Six years later the latter partner sold his interests to Mr. Frost, who with J. Edwin Frost, the present secretary and director, carried on under the name of the Smiths Falls Malleable Iron Works until 1902, when the Smiths Falls Malleable Castings Company was incorporated.

The business had grown from a mere infant with a cupola and a one-ton annealing oven to two plants covering the better part of two acres with an annual capacity of 8,000 tons and employing 250 men.

In 1906 the Rideau Malleable & Foundry Company, Limited, was organized by local citizens of the north end of the town and when the slump and business depression of 1907 came on, this plant was absorbed by the Smiths Falls Malleable Castings Company, Limited, thereby increasing the capacity by 3,000 tons annually.

Since the original incorporation in 1903 the company has operated on a capital of $150,000, but with the rising cost of manufacture it was found inadequate and also since they suffered the loss of three of their active firm members, viz., Wm. H. Frost and his two sons, Burton H. and E. Theodore, they felt the necessity of a reorganization and therefore incorporated a new company now known as Smiths Falls Malleable Castings, Limited, with an authorized capital of $750,000, which company bought out assets, goodwill, etc., of the old company.

The company contemplates doubling the capacity of plant No. 2 and have made provision in the charter for the manufacture of steel castings and will instal an up-to-date machine shop to be in a position to handle anything offered.

The present officials of the company are Geo. B. Frost, president and general manager; Dr. C. A. Patterson, vice-president and treasurer; J. E. Frost, secretary and sales manager, all three directors and constituting a managing board.

Personal

Gordon Perry, president of National Iron Corporation, of Toronto, has been appointed chairman of the board of the English Electric Company, one of the largest makers of electrical equipment in Great Britain.

F. W. Evans, manager of the Toronto branch of the Canadian Fairbanks-Morse Company, has returned to the city after a six weeks' vacation. Mr. Evans' health is much improved as a result of the trip.

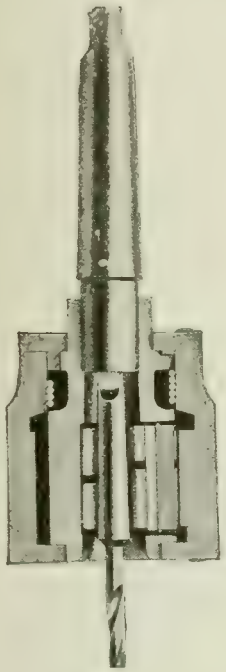
Alexander Johnston, former deputy minister of marine and fisheries, will be reappointed to this old post in the department. Mr. Johnston resigned his position after ten years of capable service to join the British Empire Steel Corporation, as assistant to Roy M. Wolvin, general manager.

Safety League.—The monthly meeting of the executive committee of the Ontorio Safety League was held at the King Edward Hotel on March 8. Among other matters the meeting received a report of the sub-committee, on the annual meeting. This report calls for a two-day safety convention, to be held in Toronto on April 27 and 28. The subcommittee on papers has arranged to have papers presented on Traffic, How to Interest the Employee in Safety, Workmen's Compensation, Falls and Falling Objects, Safeguarding Machinery and School Safety.

Bought Leaside Plant.—The Leaside Munitions Company, Limited, have completed the purchase from the United States Government of the large plant erected at Leaside during the latter months of the war. This plant was built for the American Government by the Leaside Munitions Company for the manufacture of twelve-inch shells for the United States artillery, but the plant and its equipment had only been completed a few days when the armistice was signed, with the result that it was never put to its intended use. It will be used by the present purchasers for manufacturing purposes.

Aikenhead's

"Everything in Tools"



The Wahlstrom Automatic Drill Chuck

Do you discard, or salvage and repair, your tools when the tangs break? Neither is necessary if you use a Wahlstrom Automatic Drill Chuck. Good tangs or broken tangs, it makes no difference, for the Wahlstrom will hold tools whether they have tangs or not! The jaws grip on the **side** of the shank. The reduction in your tool upkeep cost, when you use these chucks, is governed entirely by the number of Wahlstroms operating in your plant.

There's no time lost in waste motion with the Wahlstrom Chuck. It is automatic and instantaneous in action. It enables the operator to make **tool changes in just two seconds,** without stopping the spindle of the machine.

Made in two different styles. One style holds No. 1, 2 or 3 Morse Taper Shank Drills—with or without a tang. The other style is made in three sizes, which hold all sizes of straight shank tools from ¼ to 1 inch.

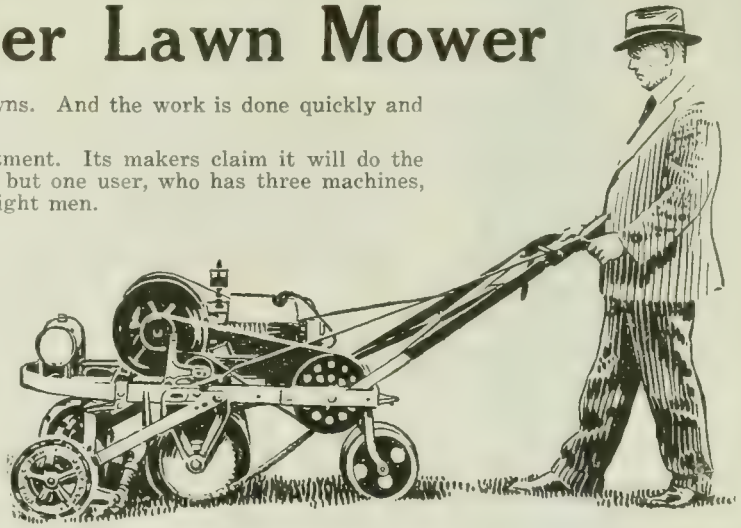
The Ideal Power Lawn Mower

Ideal Mowers insure close-clipped, velvety lawns. And the work is done quickly and cheaply in a clean, easy way.

Ideal Mowers are a real money-saving investment. Its makers claim it will do the work of five men with hand power machines, but one user, who has three machines, claims that each machine does as much as eight men.

An important feature of the Ideal Mower is that the power drive is separate from the cutting unit, so that if a stone or other obstacle gets in the way, the cutting unit will automatically stop until the obstacle is removed. Those who have used a mower to any extent will appreciate what this feature will do to prolong the life of the machine.

A booklet describing the Ideal Power Lawn Mower more fully will gladly be sent you.



Aikenhead Hardware, Limited

17 Temperance Street, Toronto, Ont.

If interested tear out this page and place with letters to be answered.

Shall Canada Trade With Germany?

ARE we going to trade with Germany? If so, upon what grounds and terms? The matter of German trade is coming up for discussion in many places. Not long since the Canadian Association of British Manufacturers had a fairly pointed argument over the problem, some holding that members had no right to act as agents for what they termed enemy lines in Canada. Others in the association held it would not be fair to restrict members in this way, as it would simply toss business over to others.

And so it goes. Nor can it be said that Germany is standing back while Canadians are making up their minds. Every week seems to show an increase in the volume of German catalogues reaching this country. Nor are they starved-looking publications one might expect to receive from a country that has gone through the experiences of the past few years.

Canadian Machinery asked some of the leading manufacturers to give their views on the matter. Our letter drew attention to the amount of business Germany was already doing here, and to the oft-repeated claim that Germany must be allowed to trade with the world in order to pay off her debts.

Menace of Cheap Labor

B. H. Neill, sales manager of Canada Machinery Corporation, Galt, holds that the Canadian plant has a right to consideration and protection before the position of Germany is considered. He says:—

"It is our opinion that German goods should not come into the country unless at a heavy surtax sufficient to offset the difference in labor costs as well as the depreciation in German currency.

"If we have to trade with Germany in order to assist her to pay her war indemnity, and by so doing have our country flooded with cheap goods while our own factories and workmen remain idle, better forget the indemnity and put an embargo against goods from a discredited nation. It is not long since every good Canadian was solemnly declaring he would never again buy German goods. How quickly these declarations are forgotten when the dollar is involved!

"Our Customs Department is already assisting German exporters by appraising values on basis of exchange on day of entry. For instance, the other day the German mark was valued at 1 7-10 cents. What protection does this afford the Canadian manufacturer who is helping to pay our own war debts?

We are directly opposed to your suggestion."

Short, But Very Pointed

Canada Foundries & Forgings, Ltd., Welland, do not mince words in stating the case as they see it. Simply this, in a letter from B. J. McCormick, general sales manager of the company:—

"Replying to your letter of March 8th on the subject of re-establishing German connections, we wish to say that we have no desire to either buy or sell any articles of commerce with these people."

Not Particularly Interested

The Mason Regulator & Engineering Co., Montreal, have not gone very fully into the matter, as it is one that does not concern them in their business relations. H. L. Peiler, general manager, writes as follows:—

"I am in receipt of your letter of the 8th instant, contents of which are noted, and with reference to which I may state that this company is not interested in products of German origin and I have, therefore, so far not been called upon to form an opinion in the matter.

"There appears to be no doubt that if we as individuals or collectively, should refuse definitely to trade with Germany, it would simply make it increasingly difficult for that country to meet her foreign obligations, and it would, therefore, appear to be a question of our general interests not to base trade relations upon prejudices aroused during the past conflict.

"However, as I have stated above, the question is one that does not directly affect this company's business."

Straight Talk Here

When J. M. Taylor, president of the Taylor-Forbes Co., Guelph, has anything to say, people generally know exactly where he stands. So in the present case, when Canadian Machinery asked the opinion of the aggressive J. M. about trading with Germany, it was not surprised at the warmth and directness of the answer it drew:—

"Your letter dated March 4th received, and we were very much surprised to learn of the volume of importation from Germany during 1920.

"Our view is we do not want to any business with Germany directly or indirectly. We are just warm-blooded enough to refrain from wanting to do business with the murderers. We are not built on the lines of some people who have no memories and can forgive and forget over night.

"The very thought of doing business with Germany is torture enough, without actually doing business with them.

"We grant you that the war indemnity must be paid, but let Germany swelter in paying it. If it will torture them and make them bleed mentally to pay the indemnity we hope those in power will keep up the good work of torture."

Don't Penalize Canada

A. M. Kerr, secretary-treasurer of the Preston Woodworking Machinery Co., holds that Canadian manufacturers need some consideration, as well as Germany, and that there should be protection against cheap German goods. "Trading with Germany," says Mr. Kerr, "is a matter to which we have not given much attention since German competition does not concern us a great deal. We agree with what you say that if Germany is going to pay the huge war indemnity, we must be prepared to go ahead and trade with her as formerly, but Canadian manufacturers should have a chance, which they will not have if Germany, at the low price of the mark, can underbid her all along the line.

"If they are able to ship goods in here and prevent us from manufacturing them it looks to me as if it would be Canada that would pay her indemnity. We don't think that Canadian manufacturers should be penalized because the German mark is worth so little and selling so much below par that they are able to ship goods into Canada so easily in competition with Canadian industries. The value of her money eliminates competition almost altogether, and we would all suffer while she pays off her indemnity. Let our country put up a tariff barrier sufficiently large to make it a competitive proposition, and then I would say it would be more nearly as it should be."

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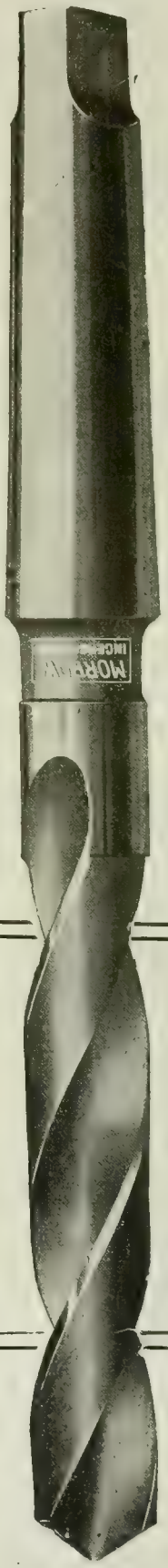

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MONTREAL NOTES

Capt. B. G. Grant, general manager and Canadian director of Armstrong-Whitworth of Canada, who has been absent on a business trip to England for the past six weeks, during which time he attended a director's meeting of the company, is expected back in Montreal about the 18th of the month.

The water is now being emptied from the Lachine Canal preparatory to the annual cleaning and inspection that is always done before the opening of navigation. Special examination will be given to all the lock sills, owing to the fact that some of them were subjected to severe strains last season by large and heavy-laden vessels. This spring inspection is a very important part of the year's work, as it minimizes the possibility of serious tie-up at a busy period of the season.

It is expected that an early opening of navigation of the St. Lawrence will take place this spring owing to the mild spell of weather that has prevailed during the past several weeks. The Government anticipate putting the ice-breakers into service this week and should the weather continue as at present there is every hope that shipping will be moving on the river about two weeks earlier than for some years back. The fact that both the Government ice-breakers will be on duty in the river this year adds to the possibility of clearing the ice at an early date.

At the regular monthly meeting of the Canadian Railway Club, held in the Windsor Hotel, Montreal, on March 8, one of the largest gatherings of the year was favored with several special features of interest. Before the regular business of the evening was commenced, a presentation was made to Gordon W. Dunn, a member of the club, this being in the form of a bronze medal of the Canadian Royal Humane Society, for the rescue of Miss Schoenart, of Philadelphia, from the Niagara River, on the 15th of September last. The paper of the evening was prepared and read by Samuel Lynn, general master car builder of the Pittsburg and Lake Erie Railroad, the title being: "Repairs and Maintenance of Steel Freight Cars." The paper was highly interesting and instructive and was illustrated by lantern slides.

Operations will soon be started on the dismantling of the Old Knox Church, at the corner of Mansfield and Dorchester Streets, in Montreal, to make room for the large addition that the Sun Life Insurance Company intend making to their present building. This property was acquired at the time of the original purchase, but up until the present the additional office space was not required. It is expected that operations will have advanced sufficiently far enough to lay the corner stone of the new building some time in May, this year being the jubilee of the company. The cost of the new addition will be approximately $1,250,000 and it is expected that it will be completed in 1923. The building will, in every respect, be identical with the large one now used by the company. The architects are Darling and Pearson, designers of the new Government buildings.

NOVEL FORM OF WARNING

The possibility of using stenches as a warning in mines was recently investigated by the Bureau of Mines, U.S.A., and forms the subject of a special report. It is stated that stenches as a warning have a decided action; they exert a positive effect because of their offensiveness. When miners smell a disagreeable stench they instinctively desire to obtain pure air at once. The velocity of air through compressed air lines in metal mines is usually hundreds or even thousands of feet a minute, so that transmission of a stench is rapid. Warning by stenches is particularly adapted to mines equipped with compressed air. In coal mines, where only the ventilating current is available for carrying a stench the average velocity is low, of the order of 200 feet a minute or less. If the velocity of the air in a compressed air line is rapid, a small quantity of material would give more effective warnings than the same quantity in a ventilating current, because of being liberated in concentration at the points where most needed, and being less diluted with air. However, the method may be useful in some mechanically ventilated mines where compressed air lines are unavailable. Of the chemicals tried, it would appear that compounds of mutyl mercaptan are the best adapted for the purpose in view.

MICRO-GAGE SET

The Van Keuren Company, of Boston, Mass., are now offering to the trade a set of micro-gages which give dimensions in any desired thousandth of an inch from 0.4 to over 5 inches by combining two or more of the various gages. The set is very serviceable for both tool-room and production work. The set consists of only sixteen separate gages. The gages are cylindrical and made of tool steel, heat treated and seasoned, faces being ground and lapped to a mirror finish. It is stated that the working faces are held within a few millionths of an inch for parallelism and flatness of faces. At the standard temperature of 68 degrees it is claimed that the size of any block is correct to 0.000025 of an inch.

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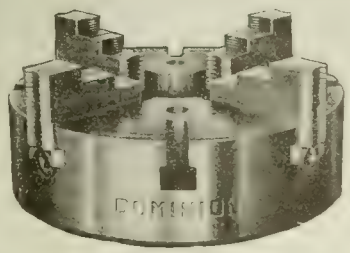

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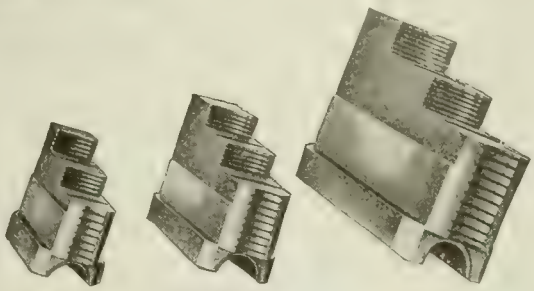

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Consulting and Designing — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.
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HIGH CLASS **Machine Tools**
FOR SHIPYARDS AND CONSTRUCTIONAL WORKS
BERTRAMS LIMITED
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New Catalogue

The Elk Fire Brick Company of Canada, Ltd., Sun Life Building, Hamilton, have issued a bulletin describing their products. This company manufacture refractory brick in all shapes, for furnace linigs, blast furnaces, cupolas, fire brick arches, checker brick, etc. The catalogue illustrates every different shape, and gives information on the sizes available, and the guarantees given, also the deviations from specifications allowed. The shapes shown have been adopted by the Refractories Manufacturers' Association as standard. In addition to the foregoing there are a number of tables showing numbers of bricks required of various shapes to make certain size linings. Other useful tables are fusion points of different materials, and comparison of the different thermometer scales, circumference and areas of circles, and weights of various materials.

Marine Engineering

It has been announced by Admiral Benson, chairman of the Shipping Board, after hearing claims of coast shipping representatives, that fifteen vessels will soon be allocated to service between Pacific coast ports and the Orient.

The death occurred at Sarnia on March 6 of Capt. Walter E. Linton, a well-known resident of Mooretown. The late Capt. Linton was one of the best-known sailors in this district, and had been sailing out of great lake ports for the past 26 years.

The steamer Dougald Mac, formerly the Columbia, well-known on the River St. Lawrence as a coal carrying steamer, is being converted into a tow barge by the Sincennes McNaughton Company. The vessel will ply during the coming season between Montreal and Oswego in the coal trade.

A shipbuilding correspondent of The Morning Post, London, England, writes that almost 20 per cent. of the shipbuilding berths in England are vacant, and shipbuilders have no contracts on hand for ships to be laid down. In a short time, as the ships under construction are completed, the number of vacant berths will be increased. Within the last twelve months twice as many orders have been cancelled as have been placed. While costs remain at the existing high level there is no chance of British shipbuilders getting new orders in any quantity, and more particularly is this true when there is so much German tonnage being offered for sale on behalf of the Government. Shipping and shipbuilding have outstripped the needs of commerce.

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Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

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Light and Medium-Bench and Floor Repetition Castings. Capacity 15 tons per day
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money
Semi-finishing operations on Lathe or Grill on Castings supplied if required
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1—24" x 12' Canadian Machinery Lathe
2—22' x 10' Davies Lathes.
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6—20" x 8' C.M.C. Lathes.
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1—16" x 8' C.M.C. Lathe.
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1—D-1 H. D. Colburn Drill.
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2—No. 54 Perkins Sprue Cutters.
2—2" x 26" Pratt & Whitney Turrets.
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Write us for particulars and prices.

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The proprietor of Letters Patent M. R. Matti No. 137772, relating to "Arrangement for changing the moment of fuel injection into the combustion chamber during the run of the motor and for regulating the quantity of fuel," desires to dispose of the patent or to grant license to Interested Parties at reasonable terms with a view to the adequate working of the Patent in Canada.

Enquiries to be addressed to the patentees, Svenska Aktiebolaget Nobel-Diesel, Nynashamn, Sweden.

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WANTED AS ASSISTANT EDITOR, ON group of technical papers, live-wire mechanical engineer. Qualifications required are: Age, under 45; good education; certain amount of practical experience; ability to express ideas on paper; good mixer and aggressive worker. Splendid opportunity for the right man. State full particulars in first letter, mentioning present salary. Box 152, Canadian Machinery.

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POSITION WANTED—MACHINE SHOP SUperintendent or general foreman. Acquainted with modern machine shop practice and heat-treatment of steel. Thirty years' experience. Production or contract work. Box 757, Canadian Machinery.

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Will handle medium Specialty Line — Manufacturing and Selling

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JOBBERS and DEALERS
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THIS IS THE TIME TO FILL IN THE GAPS IN YOUR EQUIPMENT WITH MY SPECIALS

1 24″ Cincinnati Shaper, B.G., practically new.

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1 26″ x 12′ G. M. C. Lathe, 3 step cone, D.B.G., Q.C.G., compound rest and hollow spindle, with extra tool post turrets and quick return now under belt.

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a drill
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a chain block
a chuck
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a crane
a stock of belting
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or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY

Classified Advertising Section

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1—30″ x 12′ "Blaisdell" (used).
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1—16″ x 6′ "Reed" (used).
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1—8″ "Rivett" Cabinet Type, full attachments (used).
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GAP LATHES

1—38″ x 54″ x 12′ Bertram (used).
1—22″ x 40″ x 16′ McDougall (used).
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1—20″ x 38″ x 12′ C.M.C. (used).

TURRET LATHES

No. 4 Millhollands, capacity 1⅝″ (used).
Several Davis Turrets and other makes. Various capacities.

SHAPERS

1—16″ "MacKenzie" B.G. Crank Shaper, (new).
1—16″ "Rae" B.G. Crank Shaper (slightly used).
1—24″ "McGregor-Gurley" B.G. Crank Shaper (used).

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1—42″ x 42″ x 20′ Putnam, 1 head (used).
1—30″ x 30″ x 10′ Pond, 1 head (used).
1—24″ x 24″ x 6′ Powell, 1 head (new).

MILLING MACHINES

1—Briggs High Duty Type "A" 22″ Traverse (new).
1—Briggs High Duty Type "B" 42″ Traverse (new).
1—Whitney Hand Miller, 18″ x 6″ table (used).
1—No. 3 Ford-Smith Plain (used).
1 No. 3 Ford-Smith Universal (used).
1—No. 4 Cincinnati Plain (used).

DRILLS

2—10″ Burke Sensitive (Bench type) (new)
1—15″ Barnes (used).
20″ "Sibley," "Champions," "Rockwell" and "Silver" (new) and (used).
1—36″ C.M.C. Heavy Duty (used).
1—3-spindle 20″ Silver Gang Drill (used).
1—4-spindle W. & R. Sensitive (used).

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1—66″ Bement-Niles Vertical, 2 heads, 24″ under rail (used).
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1—Bullard "New Era" Vertical Turret, 36″, complete equipment (new).

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1—No. 10 Racine 8″ x 8″ Cap. (new).
1 No. 7 Watkins 9″ Cap., 18″ Blade (used).
1 6″ x 6″ Racine (used).

AIR COMPRESSORS

1—12″ x 12″ Bury, Class "L," Belt driven (used).
1—8″ x 8″ Sullivan, Class W.G.-3, Belt driven (used).
1—8 x 10 x 8 Bury, Steam driven (used).

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1—Landis No. 4 Universal (used).
1—Landis Plain, self-contained, 36″ x 12″ (used).
1 Norton Plain, No. 434 (used).
1—Fitchburg Cylindrical 8″ x 36″ (new).
Several Tool and Cutter Grinders (new) and (used). "Globe," "Stevens," "LeBlond" and "Cincinnati."

MISCELLANEOUS

2—No. 4 Jno. Hall Pipe Machines (1 used) (1 new).
1—Lennox Rotary Bevel Shear, 1″ Cap. (new).
1—"High Speed" Hammer, No. 3A (used).
1—Beaudry Champion Power Hammer, No. 9 (used).
1—"Grant" Riveting Machine, No. 80A (used).
1—"Grant" Riveting Machine, No. 80B (new).
1—Arbor Press, No. 4 "Greenerd" (new).

GARLOCK-WALKER MACHINERY CO., LIMITED

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A splendid thing for any tool room. One large engineering firm, in acknowledging this chart, stated that they would like two additional copies as they intended adopting it as standard in their tool room.

We would like these charts placed in every shop in the Dominion and if there is not one in YOUR tool room, write for your copy at once. IT'S FREE.

CANADIAN MACHINERY,
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Please send $\frac{m}{us}$ free, one of your tool grinding charts.

Signed .....

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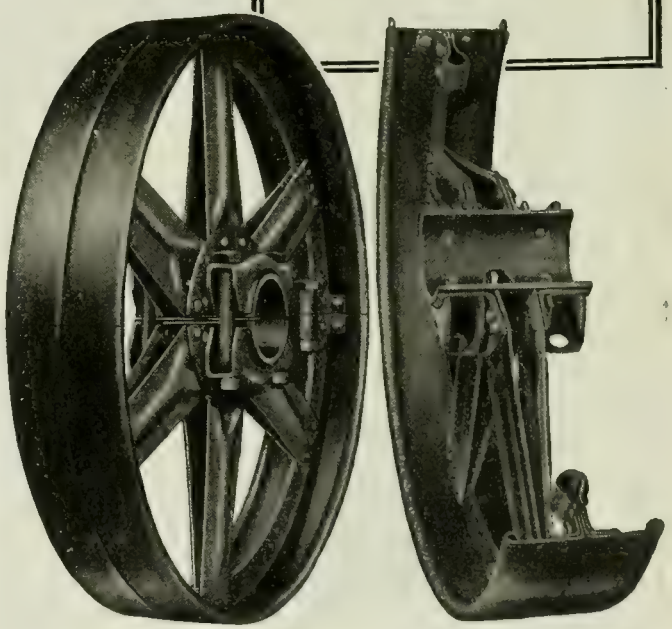
For sale by leading agents and branch houses throughout the country.



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A wheel with a broad rim transmitting power from or imparting power to machinery, or changing the direction of motion by means of a flat belt

If interested tear out this page and place with letters to be answered.

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Throw it away, therefore, and buy a new one.

It is folly to allow workmen to keep on working with files that have become the least bit dull.

You waste their time and energy and spoil the work.

Specify one of the following brands when ordering and get maximum service:

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FILES

Made in Canada by:

Nicholson File Company

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BEST BECAUSE ALL STEEL HARDENED

Spindle, Nut and Screw made of Bar Steel. Body drop-forged. Long lasting under hardest use.
Write for free catalogue.

Armstrong Bros. Tool Co.
"The Tool Holder People"
335 N. Francisco Ave., Chicago, U. S. A.

KELLER-MASTER

KELLER-MASTER
ROTARY GRINDER

Ten pounds lighter, yet more rugged than other types with same power and speed—free from vibration, which insures endurance in operator and tool—ample power to sustain speed under load—are the salient features of the NEW Keller-Master Rotary Grinder.

KELLER-MADE
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KELLER
PNEUMATIC TOOL COMPANY
GRAND HAVEN, MICHIGAN
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A New and Improved
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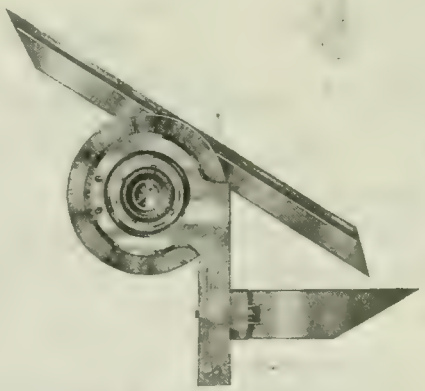

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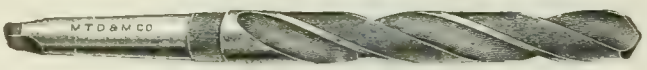

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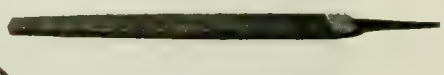

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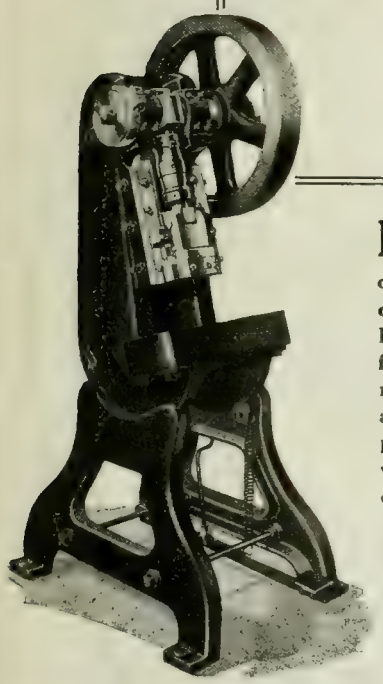

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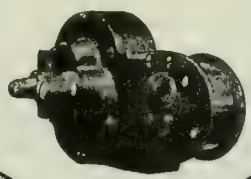

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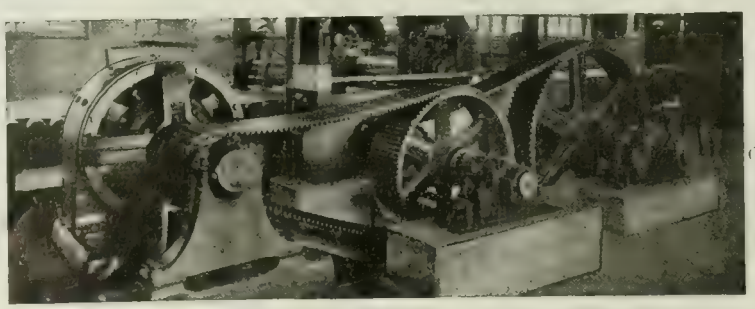

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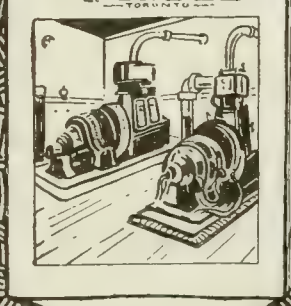

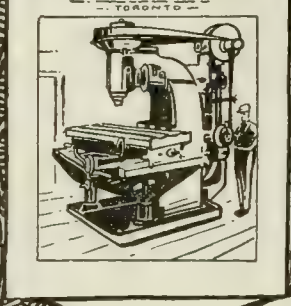

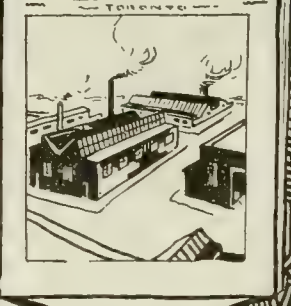

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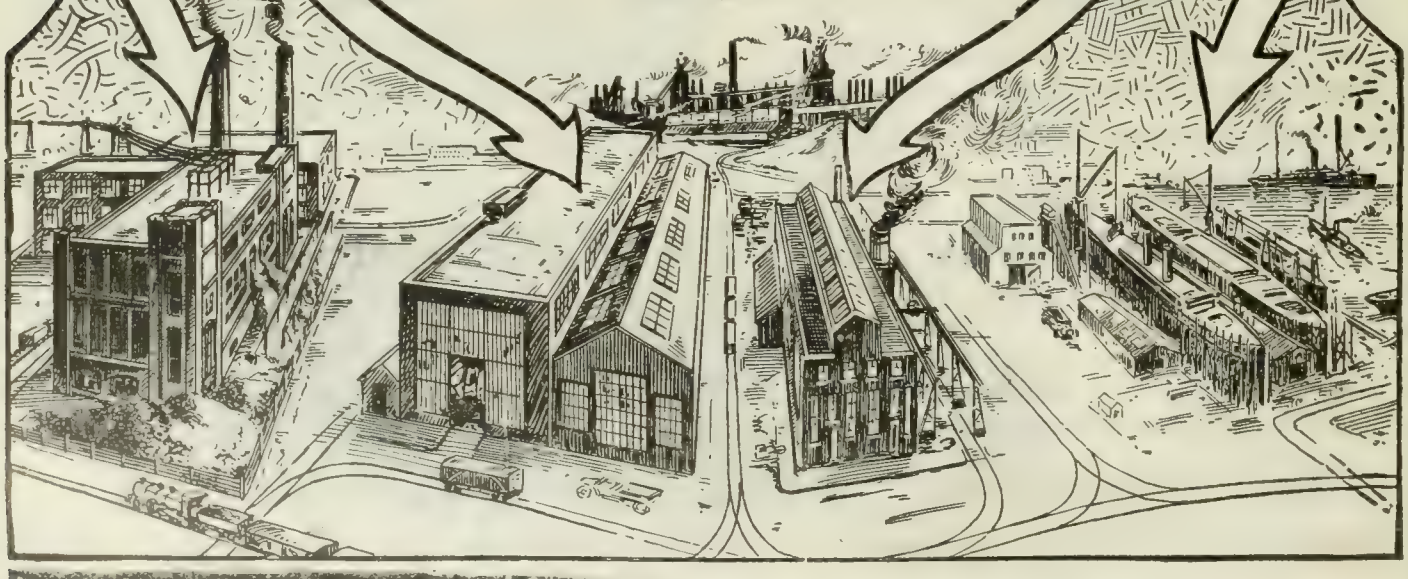

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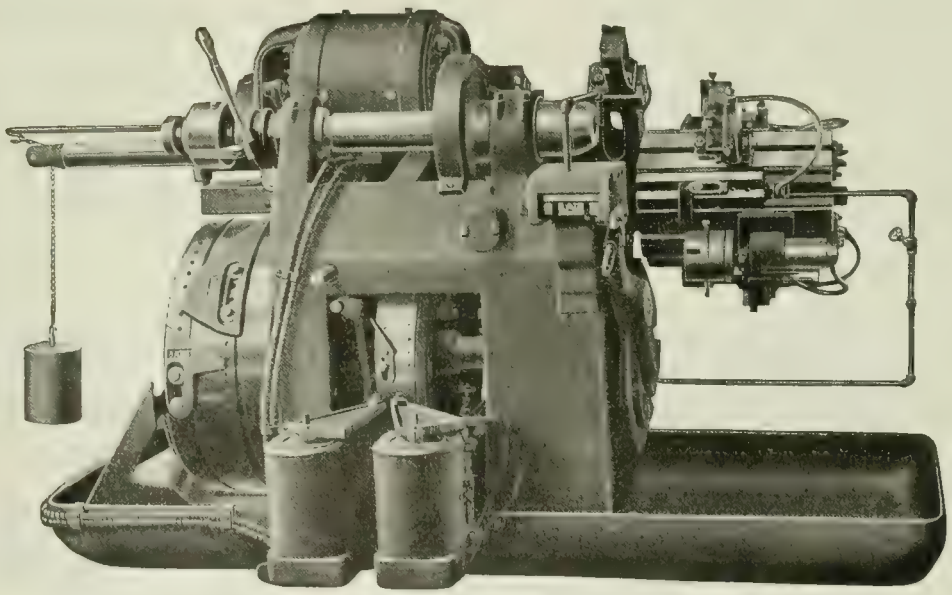

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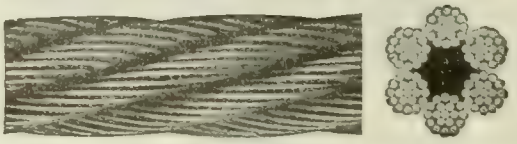

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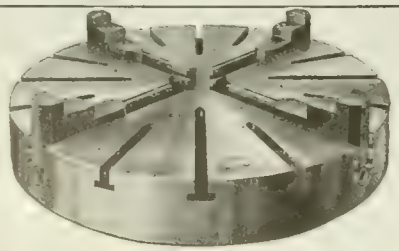

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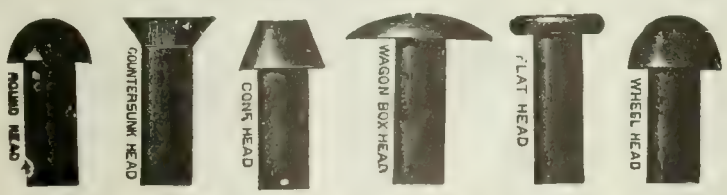

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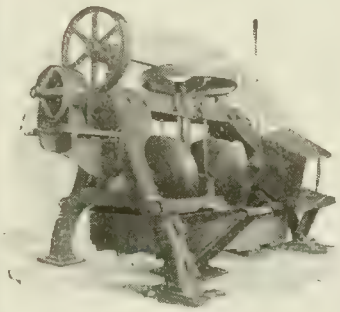

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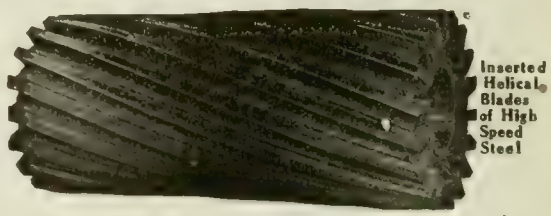

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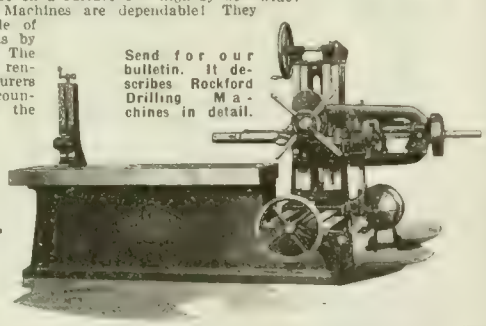

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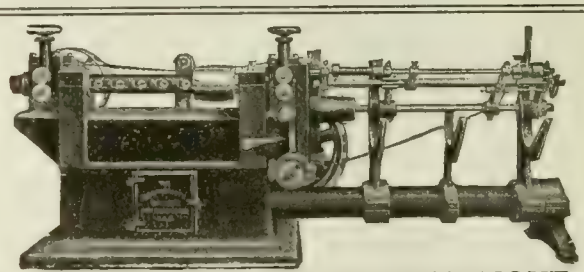

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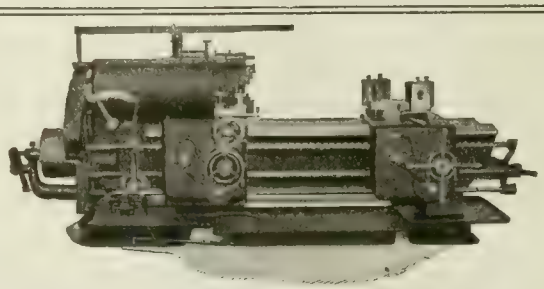

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Accumulators, Hydraulic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Air Lifts
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Air Purifiers and Coolers
Sturtevant Co., B. F., Boston, Mass.

Analyses, Chemical
Toronto Testing Laboratory, Toronto, Ont.

Angle Bars
Steel Co. of Canada, Ltd., Hamilton, Ont.

Anvils
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

Arbors
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O
Ford-Smith Machine Co., Hamilton, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

Axles, Car
Dom. Foundries & Steel, Hamilton, Ont.

Babbitt Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Balls, Brass, Bronze and Steel
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Barrels, Tumbling
Baird Machine Co., Bridgeport, Conn.
McDougall Co., Ltd., R., Galt, Ont.

Bars, Boring
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

Bars, Boring, Portable
Underwood Corp., H. B., Philadelphia, Pa

Bars, Bronze Cored
Moore & Son, Thos., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Bars, Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bars, Steel
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

Bearings, Ball
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Bronze
Tallman Brass & Metal Co., Hamilton, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Die-Cast
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

Bearings, Journal
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Bearings, Roller
Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Belt Cement
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

Belt Clamps
Graton & Knight Mfg. Co., Worcester, Mass.

Belt Dressings and Fillers
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

Belt Fasteners
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Belt Lacing
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que

Belt Lacing, Steel
Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Hinged
Flexible Steel Lacing Co., Chicago, Ill

Belt Lacing, Flexible Steel
Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing Machines
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Belt Joiners, Conveyor
Flexible Steel Lacing Co., Chicago, Ill.

Belt Tools
Graton & Knight Mfg. Co., Worcester, Mass

Belting, Chain
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Belting, Fabric
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

Belting, Leather
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

Belting, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont
Quaker City Rubber Co., Philadelphia, Pa.

Belts, Abrasive
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

Bench Countershaft Standards
Ford-Smith Machine Co., Hamilton, Ont

Benches, Work
Aikenhead Hardware Ltd., Toronto, Ont.

Bending Machines, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Bins, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Blocks
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Chain (See Hoists, Hand)
Aikenhead Hardware Ltd., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Die
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont

Blocks, Pillow
Can. Link-Belt Co., Toronto, Ont.

Blowers
Can Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass

Bolt and Nut Machinery
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

Bolt and Nut Machinery, Automatic
National Acme Co., Cleveland, Ohio.

Bolts and Nuts
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bolt Threading Die Heads
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

Boosters
Sturtevant Co., B. F., Boston, Mass.

Boring and Turning Mills, Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

Boring, Drilling and Milling Machines, Horizontal
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks Morse Co., Ltd., Montreal.
Garlock-Walker Mchy Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa

Boring, Drilling and Milling Mach., Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Boring Heads
Aikenhead Hardware Ltd., Toronto, Ont.

Boring Tools
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

Brakes, Magnetic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Brass
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Bricks, Fire
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

Bridges
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

Broaching Machines
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont

Bronze
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Bronze, Phosphor
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

Bucket Carriers, Pivoted
Can. Link-Belt Co., Toronto, Ont.

Buffing or Polishing Machines (See Polishing and Buffing Machines)
Blount Co., J. G., Everett, Mass.
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U S. Electrical Tool Co., Cincinnati, O

Bulldozers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

Burners, Oil and Gas
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

Bushings
Fisher Motor Co., Ltd., Orillia, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Cabinets, Oil
S. F. Bowser & Co., Ltd., Toronto, Ont.

Calipers
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass.

Cams
Canada Foundries & Forgings Co., Welland, Ont.

Can-Making Machinery (See Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que

BUYERS' DIRECTORY

Carbide
Union Carbide Co of Can., Ltd., Welland, Ont.

Cars, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Castings, Aluminum
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Brass and Bronze
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Copper
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Marine
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Castings, Die Molded
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Ferro-Alloy
Can. Steel Foundries, Montreal, Que.

Castings, Iron
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Hyd. Press
Can. Steel Foundries, Montreal, Que.

Castings, Monel Metal
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

Castings, Naval Bronze
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Nichrome
Can. Driver-Harris Co., Walkerville, Ont.

Castings, Nickel
Can. Hanson & Van Winkle Co., Toronto, Ont.

Castings, Semi-Steel
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

Castings, Steel
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

Cements, Iron
Smooth Mfg. Co., Jersey City, N.J.

Centering Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

Chains (See Sprockets and Chains)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

Chains, Driving
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg Co., Lisbon, Ohio.

Chasers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chemists
Toronto Testing Laboratory, Toronto, Ont.

Chucking Machines
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Chucks, Drill
Jacobs Mfg. Co., Hartford, Conn.

Chucks, Drill and Tap
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks Morse Co., Ltd., Montreal
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Lathe
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Magnetic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chucks, Planer
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Chucks, Vertical Boring Mill
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Clamps, Machinists'
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

Cleaners, Metal, Waste, General
Oakley Chemical Co., New York, N.Y.

Clocks, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Clutches, Friction
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont

Coal and Ash Handling Machinery
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Coal-Storage Systems
Can. Link-Belt Co., Toronto, Ont.

Collars, Shaft or Set
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

Collets
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Compounds, Carburizing, Case Hardening and Tempering
Cataract Refining Co., Toronto, Ont.

Compounds, Cleaning
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compounds, Cutting, Drilling, Grinding, Screw Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compressors, Air
Curtis Pneumatic Machinery Co., St. Louis, Mo.

Compressors, Air and Gas
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Cones, Friction
Norton Co. of Can., Ltd., Hamilton, Ont.

Connecting Rods and Straps
Canada Foundries & Forgings Co., Welland, Ont.

Contract Work
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros Mfg Co., Inc., St Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

Conveyors and Elevators (See Elevators)
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

Conveyor Belt Joiners
Flexible Steel Lacing Co., Chicago, Ill.

Copper
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Cored Bronze Bars
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Cotter Pins
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Counterbores
Cleveland Twist Drill Co., Cleveland, O
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Counters, Revolution
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Countershafts
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg Co., Milwaukee, Wis
McDougall Co., Ltd., R., Galt, Ont.

Countersinks
Butterfield & Co., Inc., Rock Island, Que
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Couplers, Car and Locomotive
Can. Steel Foundries, Montreal, Que.

Couplings, Flexible
Holden Co., Ltd., Montreal, Que.

Couplings, Rigid
Bernard Industrial Co., A., Fortierville, Que

Couplings, Shaft
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

Cranes, Hand (See Hoists, Hand)
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

Cranes, Locomotive
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Cranes, Traveling
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Crank Pin Turning Machines
Garlock-Walker Mchy Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H B, Philadelphia, Pa.

Cutters, Flue
Holden Co., Ltd., Montreal, Que.

Cutters, Gear
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, High Speed
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Milling
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

Cutters, Stay Bolt
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Thread
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

Cutting-Off Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Cutting-Off Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

Cutting Oil Filters (See Oil Filtering Systems)
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

Cutting, Oxy-Acetylene
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Cutting, Oxy-Hydrogen
National Electro Products, Ltd., Toronto, Ont.

Dealers, Machinery (See Searchlight Section)
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Deckle Straps
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Diamonds, Black and Rough
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond, Carbon and Bortz
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

Diamond Crossings
Can. Steel Foundries, Montreal, Que.

Die-Castings
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Dies, Pipe-Threading
Jones & Lamson Machine Co., Springfield, Vt.

Die Sinking Machines, Automatic
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

Die Sinkers
Kimber & Hillier, St. Catharines, Ont.

Dies, Screw and Thread Cutting
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

Dies, Sheet-Metal and Sub-Press (See Tool Work)
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

BUYERS' DIRECTORY

Dies, Forging
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

Dies, Hammer
Kimber & Hillier, St. Catharines, Ont.

Dies, Self-Opening, Adjustable
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Disc Cement
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Dividing Heads
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago, Ill.

Drafting Boards and Tables
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Drafting Materials
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Dressers, Grinding Wheel
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy Co., Grand Rapids, Mich

Drill Holders
Armstrong Bros. Tool Co., Chicago, Ill.

Drill Rods
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drill Speeders
Canada Machinery Corp., Galt, Ont.

Drilling Machine Heads
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

Drilling Machines, Automatic
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Bench
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Electric and Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis

Drilling Machines, Gang
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drilling Machines, Heavy Duty
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill

Drilling Machines, Multiple Spindle
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

Drilling Machines, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Drilling Machines, Portable
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Radial
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Drilling Machines, Sensitive
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Turret
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

Drilling Machines, Vertical
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Steelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Drills, Center
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drills, High Speed Twist
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Drills, Twist and Flat
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

Dust Handling Equipment
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

Electrical Instruments
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

Electrical Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

Elevating Trucks (See Trucks)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Elevators and Conveyors
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

Emery Wheels (See Grinding Wheels)
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

Engines, Capstan
Kennedy & Sons, Wm., Owen Sound, Ont.

Engineers, Mechanical
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

Expanders, Tube
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Eyeglasses, Safety (See Goggles, Safety)
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

Fans, Electric
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

Fans, Exhaust
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fans, Ventilating
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

File Handles
Ingersoll File Co., Ltd., Ingersoll, Ont.

Files and Rasps
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

Filing Machines
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Filler, Iron (See Cements, Iron)
Smooth Mfg. Co., Jersey City, N.J.

Fire Extinguishers
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Fittings, Pipe
International Malleable Iron Co., Guelph, Ont.

Flexible Shafts
Aikenhead Hardware Ltd., Toronto, Ont.

Flux, Galvanizing
British Smelting & Refining Co., Ltd., Montreal, Que.

Fluxes, Welding
L'Air Liquide Society, Toronto, Ont.

Forging Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

Forgings, Drop
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

Forgings, Hammer
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Foundry Equipment
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Foundry Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Frogs, Spring or Rigid
Can. Steel Foundries, Montreal, Que.

Fuel Oil Burning System
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Heat Treating Coal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

Furnaces, Heat Treating Oil and Gas
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces and Ovens, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

Furnaces, Tempering and Annealing
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furniture, Machine Shop
Garlock-Walker Mchy. Co., Toronto, Ont.

Gages, Comparator
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

Gages, Measuring (See Tool Work)
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, mass.

Gages, Recording
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

BUYERS' DIRECTORY

Gages, Snap, Thread and Cylindrical
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Special Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Standard
Armstrong Whitworth Co. of Can., Lt Montreal, Que
Atkins & Co., Inc., E. C., Indianapolis, Johansson Inc., C. E., Windsor, Ont.

Gages, Thread
Ackworthie, Ltd., John, Birmingham, Eng
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co., Toronto, Ont.

Gas, Coal Compressed
L'Air Liquide Society, Toronto, Ont.

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

Gear Blanks
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

Gear-Cutting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks Morse Co., Ltd., Montreal
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Gears, Cast
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Dom. Steel Products Co., Brantford, Ont
Ford-Smith Machine Co., Hamilton, Ont
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Gears, Dressed
Kennedy & Sons, Wm., Owen Sound, Ont.

Gears, Forged
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

Gears, Machine Moulded
Can. Steel Foundries, Montreal, Que.

Gears, Rawhide (See Gears, Cut)
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa

Gear, Silent Chain
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

Gears, Worm
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

Generators, Acetylene
L'Air Liquide Society, Toronto, Ont.

Generators, Electric
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Goggles, Safety
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa

Grab Buckets
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Grease Cups, Pressed Steel and Brass
Can. Winkley Co., Ltd., Windsor, Ont.

Greases, Lubricating
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

Grinding Discs
Ritchey Supply Co., Toronto, Ont.

Grinding Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks Morse Co., Ltd., Montreal

Grinding Machines, Abrasive Belt
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Bench
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Streimger Co. of Can., Ltd., Class A., Windsor, Ont.
Williamson & Kompass, Hamilton, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

Grinding Machines, Center
U.S. Electrical Tool Co., Cincinnati, O
Wisconsin Electric Co., Racine, Wis.

Grinding Machines Chaser
Jones & Lamson Machine Co., Springfield, Vt.

Grinding Machines, Cutter and Reamer
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Cylindrical
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Die
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
National Machinery Co., Tiffin, Ont.

Grinding Machines, Disc
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Drill
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Face
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Floor and Tool
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Grinding Machines, Internal
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Portable
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis

Grinding Machines, Power Oscillating Tool
Herbert Ltd., Alfred, Toronto, Ont.

Grinding Machines, Ring Wheel
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Snagging
Blount Co., J. G., Everett, Mass
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Surface
Garlock-Walker Mchy. Co., Toronto Ont
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machinery, Tool Post
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

Grinding Wheels
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Williams Bros., Walker Co. of Canada, Ltd., Brantford, Ont.

Guards, Machinery and Window
Can. Wire & Iron Goods Co., Hamilton, Ont.

Guards, Electric Lamp
Flexible Steel Lacing Co., Chicago, Ill

Gun-Barrel Machinery
Steinle Turret Machine Co., Madison, Wis.

Hack Saws, Power
Ackworthie, Ltd., John, Birmingham, Eng
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Gemmer Bros., Hamilton, Canada
Garlock Walker Mchy. Co., Toronto Ont
Lyman Tube & Supply Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Toronto, Ont

Hammers, Drop
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Aikenhead Hardware Ltd., Toronto, Ont
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que

Hammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich

Hammers, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hammers, Riveting
Cleveland Pneumatic Tool Co., Toronto, Ont.

Hangers, Shafting
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hardening, Case-Hardening and Tempering
Hamilton Gear & Machine Co., Toronto, Ont.

Hardness Testing Apparatus
Shore Instrument Co., Jamaica, N.Y.

Heating
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo

Hobbing Machines
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hobs
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Hoists, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

Hoists, Hand
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio

Hoists, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, Flexible Steel
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Hose, Industrial
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Hose, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que
Can. Foamite Firefoam Co., Hamilton, Ont.

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester, Mass

Hydraulic Machinery
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

Hydrogen
National Electro Products, Ltd., Toronto, Ont

Index Centers
Dickow, Fred. C., Machinery Co., Chicago, Ill.

Igniters, Gas Engine
Canada Foundries & Forgings Co., Welland, Ont.

Indicators, Speed and Test
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

Insulation
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Jacks, Hydraulic
Norton, A. O., Boston, Mass.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

BUYERS' DIRECTORY

Jigs and Fixtures (See Tool Work)
Fisher Motor Co., Ltd., Orillia, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Keyseating Machines
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Keys, Machine
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

Knives, Machine
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

Knurl Holders
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lacing Leather
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

Lamps, Electric
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

Lathe Attachments
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ort.

Lathe Pans, Portable
Canada Machinery Corp., Galt, Ont.

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

Lathes, Automatic and Semi-Automatic
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Bench
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lathes, Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Engine
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Extension and Gap
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Lathes, Heavy Duty Projectile Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blashill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Polishing (See Polishing and Buffing Machines)
Ford-Smith Machine Co., Hamilton, Ont.

Lathes, Relieving
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

Lathe, Universal Hand
Brown & Sharpe Mfg. Co., Providence, R.I.

Lathes, Screw-Cutting
Jones & Lamson Machine Co., Springfield, Vt.

Lathe, Speed and Hand
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich

Lathes, Spinning
Terry & Co., John C., Birmingham, Eng.

Lathes, Threading
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

Lathes, Vertical Turret
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

Lathes, Wood Turning
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Lead Pipe
Steel Co. of Canada, Ltd., Hamilton, Ont.

Lighting Fixtures
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

Linoleum Mill Machinery
Bertrams Ltd., Edinburgh, Scotland.

Liquid Air Plants
L'Air Liquide Society, Toronto, Ont.

Lockers, Clothes
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Lubricants
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Lubricating Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Machinists' Small Tools
Armstrong Whitworth, of Canada, Ltd., Montreal, Canada
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Manganese Steel
Can. Steel Foundries, Montreal, Que.

Mandrels, Expanding
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Mandrels, Solid
Atkins & Co., Inc., E. C., Indianapolis, I
Cleveland Twist Drill Co., Cleveland, O
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Measuring Machines
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Metals, Alloy
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Metalite Cloth
Ritchey Supply Co., Toronto, Ont.

Micrometer Calipers
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Milling Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal

Milling Machines, Automatic
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Bench
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Hand
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Horizontal and Planer Type
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Milling Machines, Plain
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Milling Machines, Universal
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Milling Machines, Vertical
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

Monel Metal
International Nickel Co of Can., Ltd., Toronto, Ont.

Motors, Electric
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Moulded Rubber Goods
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Nail Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Nails and Staples
Steel Co of Canada, Ltd., Hamilton, Ont.

Nickel, Bars, Sheets, Wire, Etc.
International Nickel Co. of Can., Ltd., Toronto, Ont.

Nickel Plating Outfits
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Nickel Silver
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Nitrogen
L'Air Liquide Society, Toronto, Ont.

Nut Tappers (See Bolt and Nut Machinery)
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished
Galt Machine Screw Co., Galt, Ont.

Nuts, S.A.E., Plain and Castellated
Galt Machine Screw Co., Galt, Ont.

Oil Filtering and Storage Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oil Storage Engineers
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oils
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers
Can. Winkley Co., Ltd., Windsor, Ont.

Oils, Soluble
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oxygen
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont
L'Air Liquide Society, Toronto, Ont.

Oxy-Acetylene Apparatus
L'Air Liquide Society, Toronto, Ont.

Packing, Hydraulic
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

Packing, Steam
Can. Consolidated Rubber Co., Ltd., Montreal Que
Can. Fairbanks Morse Co., Ltd., Montreal
Graton & Knight Mfg Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

Paper Mill Conveyors
Bertrams Ltd., Edinburgh, Scotland.

Patents
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

Pans, Wet and Dry
Frost Mfg. Co., Chicago, Ill

Pattern-Shop Machinery (See Woodworking Machinery)
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Patterns, Wood and Metal
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

Penstocks, Steel
MacKinnon Steel Co., Sherbrooke, Que

BUYERS' DIRECTORY

Phosphor Tin
British Smelting & Refining Co., Ltd., Montreal, Que.

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pig Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Bending Machines
American Pipe Bending Machine Co., Boston, Mass
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Pipe Couplings
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Cutting and Threading Machines
Can. Fairbanks-Morse Co., Ltd., Montreal
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa.

Piston-Ring Machines
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg. Co., Niagara Falls, Ont.

Planing Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Pneumatic Tools
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Polishing and Buffing Machines
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Pots, Steel
Swedish Crucible Steel Co of Canada, Ltd., Windsor, Ont.

Pressed Steel Parts
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
National Engineering Co., Sarnia, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

Presses, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Screw
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Protractors
Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers
Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

Pulleys, Metal and Fibre
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Pulp and Paper Mill Equipment
MacKinnon Steel Co., Sherbrooke, Que.

Pumps, Automobile Tire
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Pumps, Barrel and Boiler-feed
Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coalant
Trahern Pump Co., Rockford, Ill.

Pumps, Geared and Hand
Trahern Pump Co., Rockford, Ill.

Pumps, Industrial
Trahern Pump Co., Rockford, Ill.

Pumps, Hydraulic
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

Pumps, Power
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

Punches, Center
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

Punches, Power
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

Punching Machines, Horizontal
Bertrams Ltd., Edinburgh, Scotland.

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Racks, Cut
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

Racks, Storage (See Furniture, Machine Shop)
Brantford Oven & Rack Co., Brantford, Ont.

Rammers, Foundry
Holden Co., Ltd., Montreal, Que.

Reamer Holders
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

Reamers, Expanding
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Reamers, Solid
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Reamers, Taper
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Recorders, Temperature
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Recorders, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Regulators, Automatic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Rheostats
Northern Electric Co., Montreal, Que.

Resistance Materials
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Respirators
Willson Goggles, Inc., Reading, Pa.

Rivets
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Rivet Heaters
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
General Combustion Co. of Can, Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

Riveting Machines
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment
Stewart & Co., Duncan, Glasgow, Scot.

Rolls (Rubber Covered)
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Rudder Frames, Steel
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Rubber Goods, Mechanical
Quaker City Rubber Co., Philadelphia, Pa.

Rules, Steel
Chesterman & Co., Ltd., J., Sheffield, Eng.

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence, R.I

Rust Preventatives
Oakley Chemical Co., New York, N.Y.

Sand Equipment
Can. Link-Belt Co., Toronto, Ont.

Sand Mills
Frost Mfg. Co., Chicago, Ill.

Sanding Machinery
Oliver Machy. Co., Grand Rapids, Mich.

Sand Rammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Saw Frames and Blades, Hack
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

Sawing Machines, Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Sawing Machines, Power Hack
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Saw Sharpening Machines
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saw Tables, Universal
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Saws, Circular Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

Saws, Hot and Cold
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Saws, High Speed Steel
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Metal Band
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saws, Metal, Power
Clemson Bros., Inc., Hamilton, Ont.

Saws, Metal Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

Saws, Milling
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Saws, Screw Slotting
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Swing Cut-off
Oliver Machinery Co., Grand Rapids, Mich.

Scales
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal. Q.

Screens
Can. Wire & Iron Goods Co., Hamilton, Ont.

Screw Driving Machine
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Screw Extractors
Cleveland Twist Drill Co., Cleveland, O.

Screw Machine Work
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

BUYERS' DIRECTORY

Screw Machinery, Wood and Lag
Cook Co., Asa S., Hartford, Conn.

Screw Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Screw Machines, Automatic
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

Screw Plates
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Screws, Cap and Set
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Screws, Machine
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Screws, Safety Set
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Second-Hand Machinery
(See Searchlight Section)
Petrie, Ltd., H. W., Toronto, Ont.

Separators, Moisture and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Separators, Oil and Waste
Bowser, S. F., & Co., Ltd., Toronto, Can.

Shafting
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont.

Shaping Machines
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Shapers, Wood
Oliver Machinery Co., Grand Rapids, Mich.

Shears, Hand
Can. Blower & Forge Co., Ltd., Kitchener.

Shears, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stuart & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

Shearing Machines, Angle, Iron Bar and Gate
Bertrams Ltd., Edinburgh, Scotland.

Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

Sheets, Nickel, Resist, Alloy
International Nickel Co. of Can., Ltd., Toronto, Ont.

Sheets, Nickel, Monel and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Side Frames, Locomotive
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Slotting Attachments
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

Slotting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

Solders
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

Snap Flasks
Oliver Machy. Co., Grand Rapids, Mich.

Special Machinery and Tools
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Spectacles, Industrial
Willson Goggles, Inc., Reading, Pa.

Springs
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

Spring-making Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Sprockets and Chains
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Squares
Brown & Sharpe Mfg. Co., Providence, R.I.

Stamping, Metal
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
Diamond Saw & Stamping Works, Buffalo, N.Y.

Stairways, Wrought Iron
Can. Wire & Iron Goods Co., Hamilton, Ont.

Steam Specialties
Crane Ltd., Montreal, Que.

Steel Plate
Dom. Foundries & Steel, Hamilton, Ont.

Steels, Tool
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel Blooms and Billets
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steel, Cold-Rolled Strip
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Steel Castings
Dom. Foundries & Steel, Hamilton, Ont.

Steel Forgings
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Steel, Shafting and Free Cutting Screw
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

Steel, Sheet
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

Steel, Tanks
Can. John Wood Mfg. Co., Toronto, Ont.

Steel, Stainless
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel Wire Rods
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steels, Alloy, Open Hearth and Electric
United Alloy Steel Corp., Canton, Ohio.

Steels, Alloy and Carbon
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steels, High-Speed
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel, Magnet
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel, Structural
MacKinnon Steel Co., Sherbrooke, Que.

Steel Tubing, Close Joint and Welded
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

Stern Frames, Cast Steel
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Straightening Machinery
Bertrams Ltd., Edinburgh, Scotland.

Studs
Galt Machine Screw Co., Galt, Ont.

Surface Plates
Bilton Machine Co., Bridgeport, Conn.

Swaging Machines
Atkins & Co., Inc., E. C., Indianapolis, I.

Switches, Railway
Can. Steel Foundries, Montreal, Que.

Switches and Switchboards
Northern Electric Co., Montreal, Que.

Tablets, Bronze, Memorial
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Tachometers
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

Tanks, Steel
MacKinnon Steel Co., Sherbrooke, Que.

Tanks and Pumps, Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

Taper Cutting Dies
Jones & Lamson Machine Co., Springfield, Vt.

Tap Holders
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taper Pins
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Tapes, Measuring
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

Tapping Machines and Attachments
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Taps and Dies
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taps, Collapsing
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

Teeth, Dredge Bucket
Kennedy & Sons, Wm., Owen Sound, Ont.

Testing Metals and Materials
Toronto Testing Laboratory, Toronto, Ont.

Thermometers
Bristol Co., Waterbury, Conn.

Thread-Cutting Tools
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Thread Cutting Machines
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

Threading Machines
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Thread Lead Testing Machines
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Thread-Rolling Machines
Bliss Co., E. W., Brooklyn, N.Y.

Tongs
Hepburn Ltd., John T., Toronto, Ont.

Tool Cases
Rice Lewis & Son, Ltd., Toronto, Ont.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Markers, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Tool Posts, Lathe
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Steels for all Purposes
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

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Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strellinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Tool Work
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

Torches, Blow
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Trackwork, Railway
Can. Steel Foundries, Montreal, Que.

Trackwork, Manganese Steel
Can. Steel Foundries, Montreal, Que.

Transformers
Northern Electric Co., Montreal, Que.

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Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
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Petrie, Ltd., H. W., Toronto, Ont.
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Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio

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Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
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National Steel Car Corp., Ltd., Hamilton, Ont.

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Tubing, Flexible
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Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Tubing, Seamless Steel
Tube Co. of Canada, Toronto, Ont.

Tubing, Seamless Steel, Brass and Copper and Fibre
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Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Taliman Brass & Metal Co., Hamilton, Ont.

Tubing, Welded
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Tubing, Welded Steel
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Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
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Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Turrets, Tool Post
Gisholt Machine Co., Madison, Wis.

Unions, Pipe
Crane Ltd., Montreal, Que.

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Holden Co., Ltd., Montreal, Que.

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Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

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Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

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Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

Vises, Milling Machine
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Hendey Machine Co., Torrington, Conn.
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Kearney & Trecker Co., Milwaukee, Wis.
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Vises, Pipe
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Vises, Planer and Shaper
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Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

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Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

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Northern Electric Co., Montreal, Que.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Welding Apparatus, Oxy-Acetylene
L'Air Liquide Society, Toronto, Ont.

Welding, Electric
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

Welding Filler Rods
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding Machines, Oxy-Acetylene
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

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Carter Welding Co., Toronto, Ont.
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Holden Co., Ltd., Montreal, Que.
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L'Air Liquide Society, Toronto, Ont.
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National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
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Union Carbide Co. of Can., Welland, Ont.

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Wheels, Industrial
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
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Volta Mfg. Co., Welland, Ont.

Winches, Headgate
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L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

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Dennis Wire & Iron Works, London, Ont.
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Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

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Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

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Canada Foundries & Forgings Co., Welland, Ont.
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Greenfield Tap & Die Corp., Galt, Ont.

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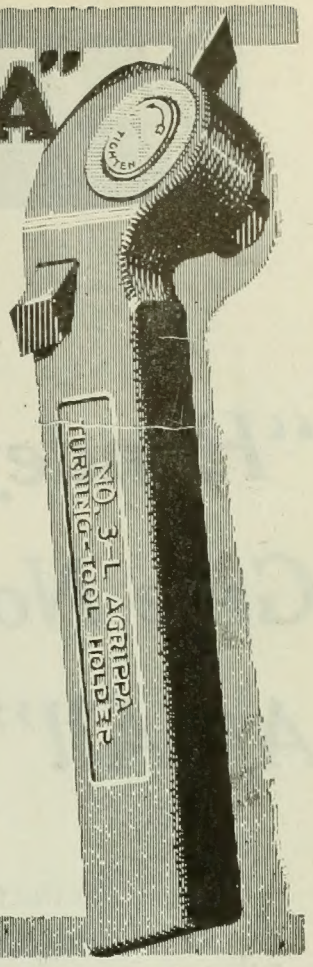

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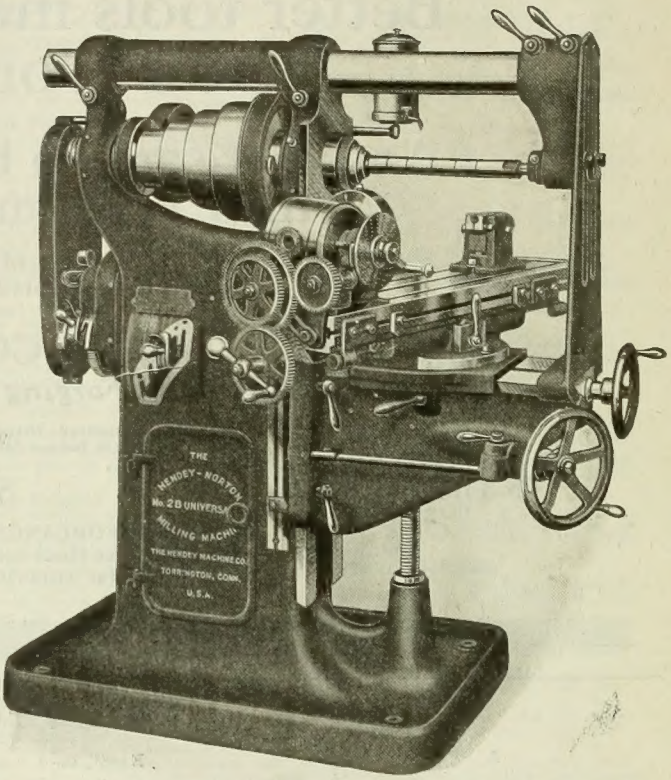

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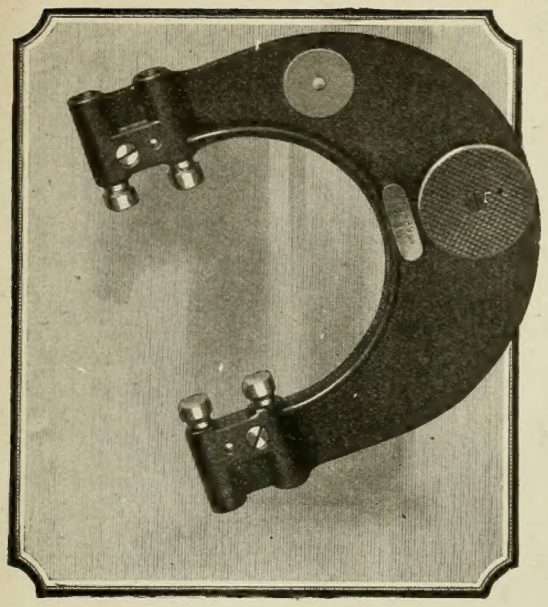

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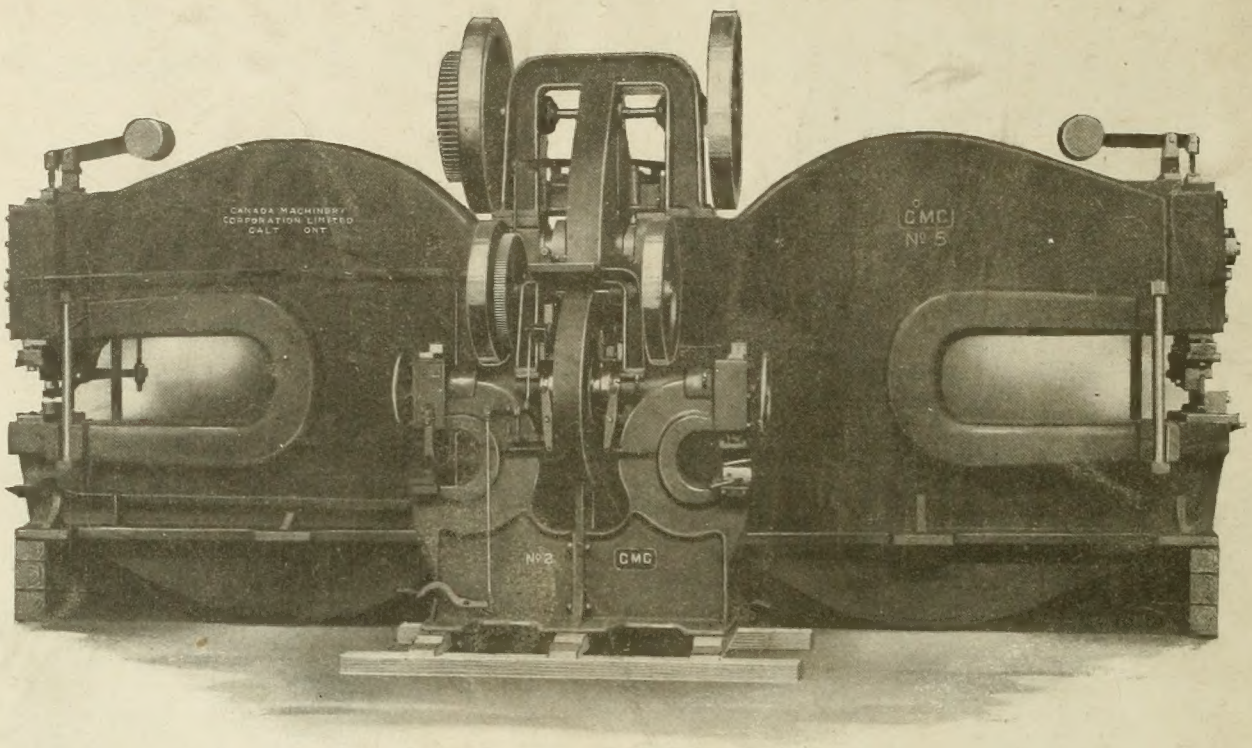

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